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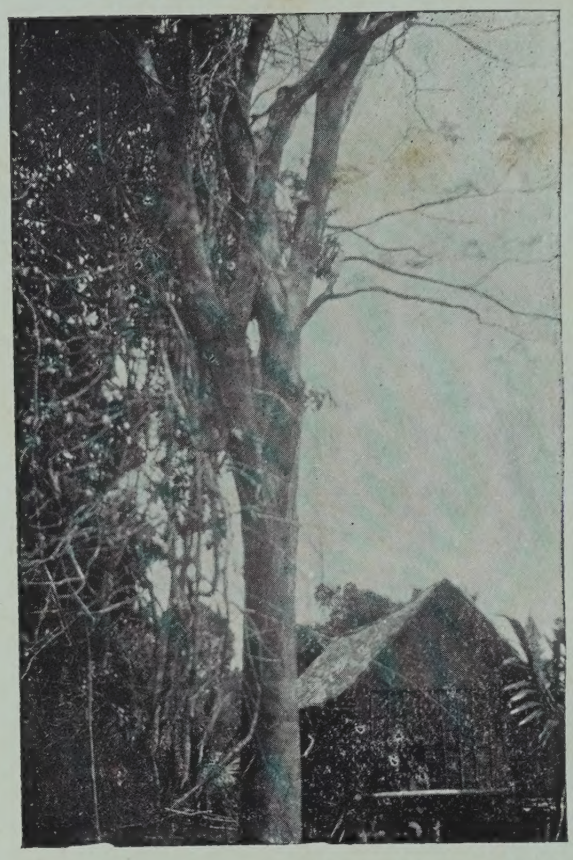

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Fig. 1. A. *Phoenix sylvestris* with four branches.

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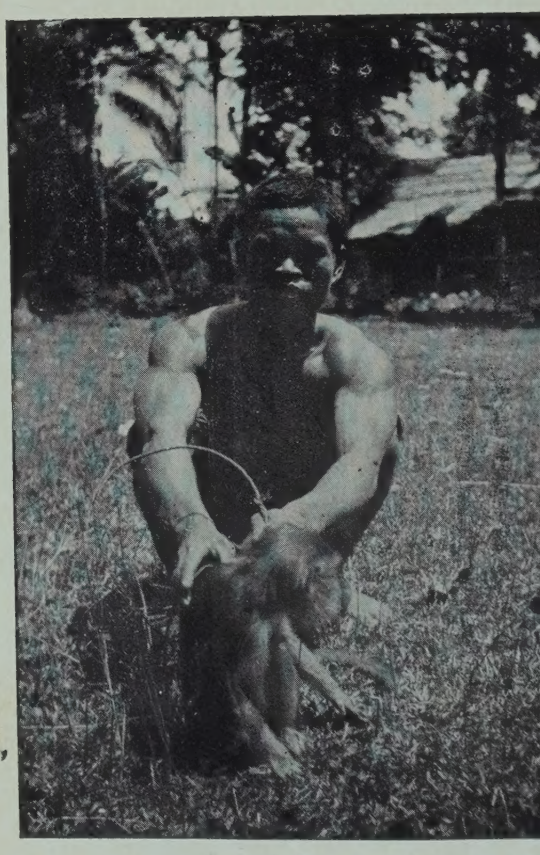

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Fig. 2. The trained monkey on a *sataw* tree in Siam.

Fig. 3. Jungli Malay bird-catchers.

Fig. 4. Malay with a monkey trained to pick coco-nuts and other fruits.

Photos 1 by E. M. Crothers, I.F.S.

2—4 by D. Bourke, I.F.S.

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MONKEY TRAINERS AND BIRD-CATCHERS IN PATTANI, SOUTHERN SIAM.

Last August I camped for just under a week in a small wooden rest-house, recently built by the Siamese Forest Department near a way-side Railway Station, in the Southern portion of the Pattani Province, not far from the boundary of the unfederated Malay State of Kelantan.

The country is beautiful, fertile, and extremely tropical, a number of hill ranges run down the Peninsula, through this Province, but none of them attain any great heights. Both the hills and much of the plains, when not cleared for agriculture or for shifting cultivation, are covered with heavy, dense, evergreen forests, producing hardwood and softwood trees of great size and stature. The forests also produce a number of interesting and valuable minor forest products, such as gums and canes.

Agriculturally the country might almost be called a potential tropical paradise, producing as it does under regular methods of cultivation, all kinds of tropical products in abundance—such as rubber, cocoanuts, betel-nuts, the betel-nut vines, manioc, pine-apples and other kinds of tropical fruits. The sago-palm abounds and the product is only used for feeding pigs and not for human consumption. In the irrigable portions there is good regular cultivation of rice, but, unfortunately, much of the country is laid waste by shifting cultivation, which as usual destroys an immense amount, to produce only a very small return.

The local population is largely Malay with a strong Chinese trading communities, and a scattered admixture of Siamese, here and there.

Whilst making excursions into the forests and round the country-side, my curiosity was at once aroused by the large numbers of tame monkeys which I saw, kept by the local Malay cultivators and fruit-farmers.

Nearly every Malay house had a tame monkey or two, tethered on the verandah or just inside the door-way, and I noticed all over the country-side the local Malays walking about with monkeys attached to long lines, trotting beside them.

On making enquiries I discovered, to my surprise, that it was the habitual practice of the local people to catch young wild monkeys and to train and use them as fruit-gatherers.

It appears that the monkeys are caught when very young and are first trained on a pole, stuck into the ground with a bunch of fruit tied to the top end ; the monkeys learn readily to climb up the pole, detach the fruit and throw it on to the ground. When the monkey is thoroughly familiar with this process, the Malay takes it out and gradually trains it on trees, until the animal becomes a real expert and will pick and throw down fruit from the tallest tree.

The monkeys are chiefly used for picking cocoanuts and *sataw* pods. The *sataw* tree *(Clarkia speciosa)* is a medium sized leguminous tree, which resembles a good deal *Albizzia* spp. It grows wild in large numbers in the Pattani forests, and is found abundantly round Malay villages and cultivations, where it is protected and probably also cultivated for the sake of its pods. The pods resemble those of *Albizzia Lebbek*, and the seed which is about the size of a broad bean, is much relished by the local people and is a common article of food all over this area. These "beans" are eaten as a vegetable, either raw or cooked in various ways.

Large and strong monkeys are needed to pick cocoanuts, as it often requires a considerable effort to detach the nuts and the monkeys sometimes have to use their teeth as well as their hands. Smaller and weaker monkeys can pick the *sataw* pods with their hands only, occasionally having recourse to their teeth. The pods grow in small clusters at the ends of the branches.

I induced a Malay to get his monkey to perform on a *sataw* tree. The monkey itself was a small greyish-brown creature with a band round its waist and a strong coir line, like a very thick fishing line attached to it. The monkey's owner had many feet of this line coiled round a reel, closely resembling a large fishing reel, made of extremely finely woven rattan canes. Photo No. 4 on plate I shows the Malay and his trained monkey.

On the order being given to climb, the little monkey ran up the tree with considerable zest, the owner down below in the meanwhile letting the line run out in fisherman fashion.

The monkey having got into the crown of the tree, ran out on to the ends of the branches, picked off the *sataw* pods and threw them down, with great rapidity, and whenever it showed any disposition to "slack" or to shirk its job, the owner could at once rouse it to a sense of duty again, by word of mouth, emphasised by sharp tugs at the end of the line.

It is said that these trained monkeys can pick as much as a man in the course of a day's work, so the fortunate owners can thus earn a full day's wages with a minimum amount of trouble to themselves.

When I tried to get the owner to entice the monkey down on to the lowest branch of the tree to photograph it, I was much amused to see that the monkey, after quickly examining the branch and finding no pods at the end of it, flatly declined to go along it at all.

Photo No. 2 shows the little monkey on the *sataw* tree, on its way down after the performance, but as the monkey is very small and the tree pretty large, it is difficult to make out the monkey in the photo, in fact it rather reminds one of those picture-puzzles in one's youth, in which the object of the puzzle was to "find the monkey." However the monkey *can* be found (perhaps with a magnifying glass) crouching just on the left of the main fork of the bole of the tree.

We all know that the numerous species of domestic animals which man possesses and uses were originally evolved from wild species in the past prehistoric ages, but considering the enormous

variety of wild animals existing on this earth, it is curious to note how very few species of wild animals are habitually caught and trained by man at the present time or within historical times, for real utilitarian purposes. In fact, at the moment of writing I can only think of 7 or 8 such examples. I omit, of course, all circus and such-like performances, which cannot be classed as utilitarian in the strict sense of the word. To this meagre list the monkey must now be added, and personally, I have never heard nor read before of the monkey being used in this useful way. Circus and barrel-organ monkeys, everyone is familiar enough with. I am informed that monkeys are used for such purposes all over the Kelantan State.

On my way back to my camp I passed on the road three Malay bird-catchers whose portraits are given in photo No. 3. Their outfit consisted of bird-lime carried in small earthen pots and in hollow bamboo culms. They carried with them on bamboo perches some very beautiful little blue paroqueets which they use as decoy-birds. When engaged in their business they pour the bird-lime from the pots into the hollow culms and from these they smear the tree-branches.

This bird-lime is made up of various sticky gums tapped from forest trees and mixed together with Dipterocarp wood-oil. I could not find out its exact composition. They catch mynahs, paroqueets and other small birds and then sell them as cage-birds.

D. BOURKE, I.F.S.

THE CULTIVATION OF CONIFERS IN NORTHERN INDIA.

(*Continued from Indian Forester, Vol. L, pp.* 616—621.)

CUPRESSUS.—A genus of about 14—16 species divided into two sections *Eucupressus* and *Chamæcyparis*. In cultivation the members of the section *Eucupressus* grow well in Dehra Dun and even in Lahore, although most of them are found at considerable elevations in the mountains. Although *Cupressus* roots fairly readily from cuttings they are so easily grown from seed that propagation by cuttings is unnecessary. They are so variable

that the species are difficult to recognise and no two authorities agree as to the number of species in the genus.

The members of the section *Eucupressus* are as follows:—

C. arizonica, Greene.—Introduced in Lahore and Saharanpur about 1912 from seed procured in Europe. A plant of about this time in Dehra Dun has just started to produce cones. Our plants are from seed collected in South Africa and have reached a height of 4—6 feet in three years from seed and are growing vigorously. This species is glaucous and ornamental, but is apt to fall over after heavy rain and requires attention to see that it keeps erect. Only the form var. *bonita*, Lemm. or *C. glabra* Sudw., is in cultivation.

C. Benthamii, Endl.—This tree has long been introduced and there are some large specimens in Dehra Dun. It resembles *C. torulosa* very closely but has less pendulous branchlets and has much more pointed bosses on the cone-scales. It is often considered a variety of *C. lusitanica*.

C. cashmeriana, Royle ex Carr.—A plant of very doubtful status. It is only known in cultivation. It is not grown in India as far as is known.

C. Duclouxiana, Hickel.—The Yunnan representative of *C. sempervirens*.—Not known to be cultivated in India.

C. funebris, Endl.—Has long been introduced but does not thrive as well as some of the other species and does not reach any great size. It is common in gardens but after reaching about 30 feet in height by 3 feet in girth it is usually past its best. It will grow in Calcutta.

C. Goveniana, Gordon.—I know of no old specimens in Northern India. We have seedlings one year old which are doing well.

C. lusitanica, Mill.—This tree is very rarely cultivated in the plains but is frequently seen in hill stations. It resembles *C. torulosa* but has wide-spreading branches and prominently pointed cone-scales. We have seedlings one year old.

C. Macnabiana, Murray.—Not in cultivation as far as is known.

C. macrocarpa, Hartweg.—This species is supposed to be in cultivation in Dehra Dun and Saharanpur, but the specimens are doubtfully true to name. It is grown in Abbottabad and probably in other hill stations.

C. sempervirens, Linn.—The fastigiate variety var. *indica* Parl., is a very old introduction to India. It was introduced to the Botanic Gardens, Calcutta, before 1794 and was probably cultivated in all the old Moghul gardens. Of recent years there has been a tendency to replace it by var. *stricta*, Aiton, a similar form cultivated in Europe. This latter form tends to be ragged and is altogether inferior to var. *indica* for formal planting. The wild form var. *horizontalis*, Gord., is also occasionally seen both in the plains and in hill stations.

C. sempervirens var. *indica* seeds freely in Dehra Dun and the seeds are quite fertile. I have heard complaints that this form does not produce fertile seed in India and this has probably lead to seed of var. *stricta* being imported in place of it.

C. torulosa, D. Don.—Was cultivated in Calcutta in 1842 and is still grown. It is not often seen in the plains of northern India but grows fairly well. It thrives in Dehra Dun where there are many specimens varying considerably in habit but they can scarcely be placed into the varieties recognised in Europe.

The members of the section *Chamæcyparis* are mostly unsuitable for the plains. They are—

C. formosensis, Henry.—Has been sown in Dehra Dun but failed to germinate.

C. Lawsoniana, Murray.—Cultivated in Darjeeling.

C. nootkatensis, Don.—Not known to be in cultivation.

C. obtusa, Koch.—Not known to be in cultivation but should do well in the Himalaya.

C. pisifera, Koch.—Is growing fairly well at Annandale, Simla.

C. thyoides, Linn.—Was in cultivation in Calcutta in 1842 and according to Voigt had been grown for many years without flowering. It is the only member of this section likely to grow at low elevations but should be given a wet situation.

The "Cedar of Goa".—The idea which has been prevalent in Europe since 1687 (Hermann, Hort. Lugd. Bat. Cat., p. 346, Juniperus ex Goa) that *Cupressus lusitanica* was introduced by the Portuguese from Goa has led to this tree receiving a quite unmerited mention in many Indian Floras. That the tree is a native of India has been stated over and over again, this statement being based only on its vernacular name. Masters in Journ. Linn. Soc., Vol. XXXI, p. 331, state that the tree is not wild in the neighbourhood of Goa, and there is no doubt whatever that it is not a tree of India proper. The only possibility of the tree being Asiatic would be to suppose that it is a cultivated form of the Himalayan *C. torulosa* but this is highly improbable as is also the suggestion that it came from China. The difficulties in connection with the tree being indigenous to India caused a shifting of position, and the statement has been made by Hooker in the Flora of British India that *C. lusitanica* "is extensively cultivated in the Western Ghauts and thence introduced into Portugal." This statement seems to be based on Dalzell and Brandis, and is much more emphatic than either. Brandis, For. Flora, p. 534, quotes Dalzell and if we turn to his Bombay Flora, Suppl., p. 83, we find under *C. lusitanica* "now common in gardens, Native and European. It does not succeed below the Ghauts and above only where the soil is rich and deep. When the tap root touches the rock below, the tree begins to die. Those planted at Koregaum and Phoolshuhr have long ago assumed an appearance denoting speedy extinction. Of those at Dapoorie one or two of the largest die off every year. The healthiest appear to be those in front of Sir Jamsetjee's bungalow in Poona but they are yet young and have their trials to go through." Following this is *C. torulosa* under which is stated "It appears to succeed better in the Deccan than the Mediterranean tree; casualties have been fewer." From this I conclude that *C. lusitanica* had in 1861 been recently imported from Europe and that a number of plants had been planted in gardens in Poona and a few other places. Dalzell and Gibson wrote their supplement mainly for the public and other gardens in or near Poona and Bombay. I do not think Hooker was justified in

stating that the tree was extensively cultivated merely on the statement of Dalzell and Gibson "now common in gardens, native and European."

The earliest reference to the Cedar of Goa in Indian Botanical Works seems to be Royle, Ill. Bot. Himal., p. 349, 1839. "The species of Coniferæ found within the limits of the Indian Flora are first *Cupressus sempervirens* called *suroo;* the Goa Cedar *Cupressus pendula* and *Thuya orientalis,* which succeed in the gardens of the North as of the South of India." Graham's Catalogue of plants grown in Bombay was also published in 1839 and he appears to have mentioned only one *Cupressus,* viz., *C. glauca,* Lamk., as grown in gardens in Bombay and the Deccan. Royle by *Cupressus pendula* doubtless intended *C. funebris* and his identification of this species as this Cedar of Goa seems to be based on the grounds that in his day, as now, it is one of the three most widely cultivated conifers. Graham may have also meant *C. funebris* but thinking it the Cedar of Goa called it *C. glauca.* This, however, is mere speculation and impossible to prove in the absence of specimens of Graham's "Cedar of Goa."

There is no evidence that *C. lusitanica* is widely cultivated in Western India and a good deal to show that it is not. Cooke and Woodrow both mention it as one of the introduced species, but neither states that it is commonly cultivated. Cameron in his Edition 5 of Firminger's Manual of Gardening mentions *C. sempervirens* and *funebris* as being the most frequent species in gardens in S. India and states that *C. torulosa* is not uncommon. *C. lusitanica* is mentioned as one of the "other species found in cultivation, mostly in Botanical Gardens."

Balfour, Timber Trees of India and of Eastern and Southern Asia, ed. 3, p. 87-88 (ed. 1 appeared in 1858) quoting from O'Shanghnessy, The Bengal Pharmacopœa, 1844, p. 621, mentions that "*C. pendula* ? is the drooping cypress or Goa Cedar of the South of Europe." This can scarcely be anything but *C. funebris* as *C. lusitanica* is separately mentioned as the "Cedar of Goa." Again quoting from Riddell, a Manual of Gardening

for Western and Southern India, ed. 3, 1856 (I do not know when ed. 1 was published) he says under *C. glauca*. "This is a tall elegant and graceful tree well adapted for border walks in a garden being always green and a favourite with the natives of India. It grows easily and is generally planted alternately with *Areca*." This can hardly be any species of *Cupressus* and seems to refer to *Casuarina equisetifolia*. The vernacular name he gives is *Saras* which is the name of *C. sempervirens*, but it is not unlikely that it is also used for *Casuarina*. Gamble gives *Serva* as the Telegu name and Talbot gives *Sura* as the vernacular name of *Casuarina equisetifolia*. If there has been confusions between *Casuarina* and the Cedar of Goa as seems probable the statement regarding its cultivation in Western India would be fully explained. So many of the authors quoted have copied from other sources, that it is impossible to say how much of what they have written is based on their own observations.

THUYA.—A genus of seven species, of which 5 belong to the section *Euthuya* and one each to *Thujopsis* and *Biota*. I have seen none of the section *Euthuya* in cultivation and they are not promising for the plains. *T. occidentalis*, Linn., was tried in Calcutta in 1809 and lived up to 1814 without flowering. Though mentioned by Voigt it was apparently not living in 1842. It is probable that other species are in cultivation in hill stations but I have not observed any. *Thuya dolobrata*, Linn., more often called *Thujopsis dolobrata*, Sieb. and Zucc, is growing well at Annandale, Simla. The only member of the section *Biota—Thuya orientalis*, Linn., is the commonest conifer in gardens in Upper India. It is probably a very old introduction being grown in Calcutta before 1794. We have specimens of it from Hoshiarpur, Hyderabad, Sind, Jubbulpore, Sukna, etc., so it is widely distributed in gardens. It is also grown in hill stations such as Simla and Naini Tal. It is very variable in cultivation being sometimes a small tree 20—30 ft. high and at other times a large shrub with many stems from the base 8—10 ft. high and rather more across. It is easily grown from seed.

JUNIPERUS.—A genus of 30–40 species of trees and shrubs. In cultivation this is perhaps the most difficult genus of the

family. The species are mostly very variable, many of them are dicœcious so that as a rule only one sex is found in any one garden. The result is that in most gardens, where many conifers are grown there are several unidentified junipers. A satisfactory monograph of the genus clearing up the confusion in the wild species would be of much help in identifying the cultivated forms. Roxburgh in the Hortus Bengalensis mentions 6 "junipers" and he shortly describes 7 in his Flora Indica. Some of these are not junipers at all as the genus is now understood and those that are junipers are probably mostly forms of *J. chinensis*, Linn.

J. chinensis, Linn., is not uncommon in gardens and is grown in several forms. It was probably introduced in 1812 to the Botanic Gardens, Calcutta, and of the form commonly cultivated in India only the male plant seems to be grown. It is propagated by cuttings and does fairly well in the plains. There are some old specimens in Dehra Dun.

J. procumbens, Sieb.—This seems to be an old introduction possibly dating from Roxburgh's time. It is often seen in gardens and grows well but does not flower.

J. recurva, Buch. Ham.—This is listed for Calcutta in 1913 and is, I believe, correctly named. The tree does not flower in Calcutta or in Lahore but grows fairly well and is ornamental.

Voigt mentions *J. barbadensis*, Linn., and *J. bermudiana*, Linn., as growing in Calcutta in 1842 and though cultivated for many years states that they had not flowered. He also mentions *J. Sabina*, Linn., as having been tried. Duthie in his Flora of the Upper Gangetic Plain mentions *J. macropoda*, Boiss., as thriving in Saharanpur but I suspect the tree referred to is *J. chinensis*, Linn.

I have seen *Juniperus rigida*, Sieb. and Zucc., growing well in Abbottabad and *J. virginiana*, Linn, doing well in Kumaon at 5—6,000 ft.

We have young plants of *J. bermudiana*, Linn., *J. virginiana*, Linn., and *J. procera*, Hochst., all doing well especially the last. Probably half the species in the genus could be grown in Dehra Dun as they are not very particular as to climate. I have found

imported seed germinate fairly well but it is apt to take some time owing to the hard bony seeds. They may be propagated by cuttings but the species with scale-leaves are said to be more difficult to root than those with needle-leaves.

(To be continued.)

R. N. PARKER, I.F.S.

THE COMMERCIAL EXPLOITATION OF INDIAN FORESTS.

"Commercial Exploitation" of Forests and "Commercial Accounting" are matters which are at present engaging the serious attention of Forest Officers. Before venturing on new schemes, it is necessary that we understand ourselves and have definite clear cut ideas of what we really want. Is it the maintenance and improvement of the Forest Estate, making it at the same time economically (not necessarily financially) worth the while of the nation, now and for ever, that we want? Or is it mere "exploitation" in the baser sense of the term that we have in view? In other words, is the idea to work the forests in accordance with the accepted principles of sylviculture and national forestry? Or is it merely to make a profit by cutting them down? If the former there is nothing new in it, but it is the same old idea which, I believe, we have been endeavouring all these years to carry out. I am afraid, however, that some of us have been caught in the glamour of catch phrases and our vision has been dazzled by the silvery implications of the magic words.

Forests constitute the living wealth of a nation but are liable to decay and death, or improvement. They are not to be worked, therefore, as mines, which may be classed as dead wealth. These are platitudes, perhaps. But sometimes platitudes cannot be too often repeated or over-emphasised. The Americans worked their forests like mines in the past. They took "the cash in hand and waived the rest," and now they are bemoaning their folly, and getting anxious about their future timber supplies

To say that we have got our forests for nothing, and that everything we get out of them, therefore, less the cost of felling, extraction and sale is net profit to us, is neither sound forestry nor national economy. Before we fell, it is incumbent on us to see that there exists on the ground sufficient regeneration which in due course will give unto posterity the equivalent of what we fell. Or, we should immediately after felling, raise artificially the required young crop and establish it by proper tending. If we regenerate artificially we must remember that we cannot go against nature by endeavouring to grow what won't grow in a particular place, or by growing what will grow there, without care or method. We must have, therefore, studied the question and formed definite ideas as to what species to regenerate with artificially and how to do it, before we start felling. This fundamental factor, in any forestry worth the name, I find sidetracked in the commercial audits carried out recently in some of these districts.

It is wrong to treat State Forest industry exactly on a par with commercial concerns. It should be considered as a trust which we have taken upon ourselves to administer for the nation or as a patrimony we are solemnly charged to pass on to those who come after us, improved or at any rate undepleted. In administering it, it would be a great help, no doubt, to know its money value; and is it not impossible to assess a money value on our forest property more or less accurately. But I venture to think that it is immaterial to the ultimate object we have in view. Having taken the forests over as a going concern, our capital is our stock in trade,—the growing stock. Every time we sell, we must replace and then see what is left over. Very simple! and yet to convince our carping critics some sort of kaleidoscopic accounting, hall-marked with the title "Commercial" appears necessary. It must not, obviously eclipse the vital point of Regeneration, but should exhibit it in the most vivid colours.

The Accountant, commercial or non-commercial, should always bear in mind that unlike ordinary mercantile enterprises it is not possible in forestry to separate capital and profits. Every tree that is cut represents part of the capital, interest and

profits. And as forest capital can be assessed only in growing stock, every tree that is cut must be replaced by sufficient regeneration to yield its equivalent in course of time, before we ever think of calculating our profits. Else, we shall be paying dividend out of capital.

Having cut and sold our timber, we must deduct from the receipts obtained thereby not only (1) the cost of cutting and extraction (production account), (2) the cost of transport and sale (sale account), (3) proportionate cost of establishment and (4) interest and depreciation on capital works, but also (5) *the cost of regeneration.* Only the balance, if any, left over is our profit. (In the matter of capital expenditure, by the way, such as roads, buildings, machinery, etc., we cannot be over careful to see that they are not of such a magnitude as the supplies available would be inadequate to repay in due course.) The last item, *viz.*, Regeneration, does not find a place in the balance sheets prepared by the commercial auditors. They have thus included their capital in their profits. In a joint stock company this is tantamount to paying dividend out of capital. It is true that we do undertake regeneration operations and spend large sums of money on them. But that is not by itself sufficient. These operations and their cost must find a place in the balance sheet itself. They should not be treated as separate investments. No company pays its shareholders part of their shares with the dividends, and collects it back again and starts a fresh share account. Regeneration is strictly incidental to forest exploitation and its cost must find a place in the Exploitation Account. We should be just neither to ourselves nor to the public, if we separate the two.

Stock taking and valuation of stock is a part of all commercial audits. But there is no mention of stock in forest audits; I mean the growing stock, which is our stock in trade. I wish the commercial auditors were also trained Foresters so that they could certify that not only is everything right on paper, but also on the ground,—not only is expenditure shown on regeneration but also that regeneration is adequate and truly represents the capital removed.

In the case of forests like those of Nilambur, conditions are slightly different in that the Government have paid for the land, the plantation and some other areas having been leased, and a big block of natural forests bought outright. The plantation areas when they came to the Government contained valuable natural forests which were cut and sold and the ground restocked with teak. In the beginning the expenditure side of the business exceeded the revenue side, but after some years matters were reversed. From that time we ought to have set off from the surplus revenue, interest on, and part of, the capital invested on the land and in planting. Having worked off the capital like this, we should have brought the estate on a par with other Forest Estates, that is, as a going concern.

In other words, the money originally invested by the Government need be considered only as a state-aid to a tottering industry to be withdrawn with interest as soon as the industry is firmly set on its feet again. After that stage is reached no distinction need be made between these forests and the other state forests as regards management and accounting. When once the thing pays itself and leaves a surplus after paying for replacing what is removed, I see no point in carrying the capital forward any more in the orthodox way.

P. GOVINDA MENON, E.A.C.F.,
Nilambur.

ARTIFICIAL MONSOONS.

The Seasoning Section of the Forest Research Institute has found a new sphere of usefulness in producing "Seasons" or weather conditions, as well as "Seasoning" and drying timber.

Do you want to know what will happen to a piece of joinery in Delhi during the annual weather changes? Will it shrink and crack during the hot weather? Will it swell and warp during the rains? What will timber in a railway carriage do if run from Dehra in the cold weather and then left out in the sun in Bombay?

Or perhaps a fungus is depreciating an otherwise perfectly good timber in the Andamans or elsewhere and you want to see it happen and note just the conditions that cause the trouble and then try until you get an atmospheric state which does not encourage the depreciation.

These varying conditions can all be reproduced within four walls, regardless of what is happening outside, and changed at will either slowly or rapidly.

As an example: Three different constructional methods were proposed for some large panelling. These would be made up during the cold weather and eventually erected in the Delhi Council Chamber. The question is what will happen to these next summer, then during the rains and the next hot weather? and anyhow which is the best construction? To settle the point in the ordinary course of nature would take two years.

Three sample panels were built up according to different designs and put in a compartment in which air was circulating and then the temperature was raised to 120°F. and the humidity adjusted to 20%. After twenty-four hours of this hot and dry weather the controls were altered and a July climate turned on—100°F. with 80% humidity. Then again the climate changed to the hot dry weather conditions of Central India.

At the end of this drastic treatment the material was examined and whilst one 5-foot panel had suffered badly another was in fair condition and the third was in good order. It follows that the best way of making these panels was discovered inside a week. And this on three panels instead of perhaps wasting time and labour on making much expensive joinery which would go wrong after having been put in place for a year or more.

Even thoroughly seasoned timber, used in a climate where there are big seasonal variations, will always contract during the dry weather, and expand during the rains. Varnish, polish or wax reduces but does not eliminate this difficulty. The designer must allow for this, but to do so, it is required to know the extent of the movement which takes place in the timber and this can be done by subjecting boards of various species to these alternating conditions.

In these hurried climatic changes, time is shortened and to compensate, temperature or humidity is exaggerated, and to make these results not merely comparative but absolute the results are corrected by comparison with timber that has been exposed to atmospheric changes over periods of years and measured continually as to expansion and shrinkage.

The relative resistance of various species of timber to exposure to heat, can be found in a similar manner using some wood of known value as standard of perfection. The classification obtained in a brief time will save expensive mistakes when trying the many Indian timbers, and will help to put each in its most useful place.

It is evident from what has been said above that we have still much to learn as not only do the climatic conditions vary from province to province but the number of useful species found in the forests of India is very large while we are only at the very beginning of our experimental work.

STANLEY FITZGERALD.

THE LATEST NEWS ABOUT SOME INDIAN TREES.

The following extract from a recent foreign government publication may amuse readers of the *Indian Forester*:—

"While Mr. P*p*n* was carrying out a difficult piece of exploration work in Ecuador, J*s*ph F.R*ck, our newly appointed agricultural explorer was searching for the source of chaulmoogra oil in Siam and Burma. This oil or rather the ethyl esters of its constituent chaulmoogric acid, which was originally discovered and described by Dr. Frederick B. Power, has come into great prominence as a cure for leprosy through the researches of Dr. Dean and his collaborators in Honolulu. The source of the oil, which comes into commerce through Burma, was quite obscure when Mr. R*ck first took up the study of these trees, and was commissioned as an agricultural explorer to investigate the whole subject; no photographs had ever been made of them. He spent several months in the jungles of Siam

and Burma and went through experiences quite as thrilling and dangerous as any to which explorers in tropical countries are liable, including a unique one with a man-eating tiger.....Not only has he in large measure solved the problem of the source of chaulmoogra oil but he obtained seeds of the true chaulmoogra tree.....as well as the false chaulmoogra tree (*Gynocardia odorata*) which for years was erroneously supposed to be the source of chaulmoogra oil."

We are sorry to have to inform Mr. R*ck that his claim comes only a quarter of a century too late. We notice that his tour included a visit to Darjeeling. Did he expect to find chaulmoogra there or was he trying to discover a view? A cheaper way of "discovering" quite a lot about chaulmoogra would be to invest a few dollars in literature. The Agricultural Ledger, No. 5 of 1905, for example, would cost only 4 cents plus postage (at normal rates of exchange and rather less as long as the dollar remains at its present inflated value). We admit that it is somewhat dull and contains no thrills from man-eating tigers. There is no view from Darjeeling in it either, but it does have some quite nice pictures showing seeds of *Taraktogenos Kurzii* under the name true chaulmoogra oil, and seeds of *Gynocardia odorata* which is stated to be the origin of the false chaulmoogra oil.

The man to make the discovery that *Gynocardia odorata* is not the source of chaulmoogra oil of commerce was a French pharmacist, M. G. Desprez, and the date 1899. The following year Sir D. Prain found that the seeds that give the true chaulmoogra oil actually come from *Taraktogenos Kurzii.*

Another statement from the same foreign source (and not as one might suppose from a student's examination paper in answer to the question "What do you know about *Dendrocalamus strictus?*") is as follows:—*Dendrocalamus strictus*—A bamboo native to India and extending to Burma, which grows on dryer ground than bamboos generally. It attains a height of 100 feet and its strength and solidity render it fit for many select technical purposes. This bamboo endures great cold as well as dry heat and is useful for consolidation of embankments on account

of its network of fibrous roots. It occasionally forms forests of its own, seeds almost annually, which is exceptional amongst the *Bambusaceæ*, and is readily grown from seed....."The writer of this should be given the credit of knowing that *Dendrocalamus strictus* is a bamboo and not a palm or bark-beetle or something of that sort.

R. N. P.

COMMERCIALISATION OF GOVERNMENT CONCERNS.

Two important companies have been formed to take over from the United Provinces Government the Government turpentine and rosin factory and the Government sawmill and turnery at Clutterbuckganj, near Bareilly,—the Indian Turpentine and Rosin Company, Limited, and the Indian Bobbin Company, Limited, with offices in the civil lines at Cawnpore. In the case of the former, 50,000 shares of Rs. 10 are offered to the public, the Government retaining 60,000 shares, while in the case of the Bobbin Company, 45,000 shares are offered, Government holding a similar number of shares. Besides, Government also holds debentures of the value, approximately of Rs. 6 lakhs, in the two companies. The Boards of Directors consist of Mr. H. G. Billson, Chief Conservator of Forests, Mr. C. T. Allen, C.I.E., Mr. T Gavin Jones, M.L.C., and Mr. J. P. Srivastava. The business acquired by the Companies includes a concession in the shape of first option on and guarantee for the supply of crude rosin from the Kumaon forests and timber from the Government forests for the manufacture of bobbins and other turnery articles. In connection with the Bobbin Company, additional machinery, costing about Rs. 3 lakhs, was ordered from England and has now been erected in order to increase the outturn of bobbin. With this end in view the services of a European expert have been requisitioned as manager. The outturn capacity of the company's plant inclusive of the additional machinery recently installed, is estimated to be worth, approximately, Rs. 11 lakhs per annum in bobbins alone, exclusive of the outturn value of other turnery articles. There is a wide scope for the absorption of the company's products, especially in view of the 15 per

cent. duty imposed on imported bobbins, and it is stated that extensive orders have already been received. In the case of the Turpentine and Rosin Company, the industry is already a well-established one. There is only one other factory in India, and the monopoly of the entire Indian market in turpentine and rosin is held by these two factories. According to Government reports the United Provinces Forest Department has made a profit of about Rs. 20 lakhs during the seven years ended 31st March 1922, which period includes one year in which, owing to extensive fires in the Kumaon forests, the factory had to remain practically closed for want of raw material. The terms of transfer from the possession of Government are very favourable, and the companies are starting under very good auspices.

THE MAKILING ECHO.

We have received Nos. 1—3 of Vol. III of the *Makiling Echo*, a journal issued quarterly by the Division of Investigation, Bureau of Forestry, Philippine Islands, at Los Banos College, Laguna. It displays many points of interest and originality not the least of which is the fact that it dispenses with the printing press; the original typescript is hectographed and the sheets are tied together with the bast of *Abroma fastuosa* (Sterculiaceæ).

Among the technical articles are contributions on the relative durability of Philippine woods, fishponds in swamps, the manufacture of charcoal by the Japanese process, rafting and loading timber in Palawan and an account of a fungus, *Schizophyllum alneum*, considered to be the cause of death of many trees in Southern Luzon. The last article is illustrated by actual specimens of the sporophores gummed to the paper.

The college student is catered for more particularly by lectures on geology and soils in relation to forestry, the grammatical use of English, etc., and by Notes on the activities of present and past students.

THE MADRAS FOREST COLLEGE MAGAGINE.

We regret to learn that the committee of management of the Journal of Coimbatore College has decided to publish only two issues a year in future, and is contemplating the suspension of its magazine, if there is no improvement in the contribution of articles from outside. The present number, Vol. IX, No. 1, contains the winning essay for the *Indian Forester* prize for 1924, by K. P. Rajalingam on the Regulation of Grazing in Forests, and also articles on the forest village system in the Javadi Hills of the N. Arcot District, and on a fight between wild dogs and a sounder of wild pigs; and accounts of the prize-giving and athletic sports.

REVIEWS.

RECENT DEVELOPMENTS IN LOGGING.

LOGGING, by RALPH CLEMENT BRYANT, F.E., M.A.; 2nd Edition, Revised, pp. 556, figs. 165. John Wiley and Sons, Inc., New York: Chapman and Hall, Ltd., London.— 1924. Price 22*s*., 6*d*. net.

The aim of the author, as stated in the preface to the first edition, was to bring out a text-book for use in Forest Schools. In the second edition the subject matter has been brought up to date and to some extent re-arranged. The book contains a very complete account of logging practice throughout the American Continent, and therefore applies to Canada as much as to the U. S. A.

When the reviewer was sent on deputation to America in 1918, to study Western methods of logging, Bryant's book was the only one of its kind then available. Perusal of the book, and the personal advice and assistance so generously given by Professor Bryant, made all the difference to the value of the tour. Within the short space of five months it was possible to form a very comprehensive idea of logging practice everywhere,

The chapter on Tractors in the second edition is of special interest to the writer, because of the few opportunities there were in 1918 for seeing tractors at work, and the great developments that have subsequently taken place in this branch of the logging industry. It is now beyond question that tractors, especially of the caterpillar type, have a recognized position in lumbering in America. Their field of usefulness is likely to increase in the future with carefully conducted experimental work.

A number of tractors were imported into Burma about four years ago. The writer cannot say for certain what has happened to them, but he is under the impression that they have not been looked upon as a success. It would serve a very useful purpose if the subject were studied on the spot, and the results communicated to the *Indian Forester*. The writer is still convinced that there is a good field for them in logging operations in the East. The following short extracts from chapter XIII are very sound :—

> Many breakdowns could be eliminated if competent drivers only were hired, and they were financially interested in the continuous productive run of the machine,.....
>
> The relative efficiency of tractors as compared with animals depends on many factors. Other conditions being equal, the horse has advantages over the tractor in work which is no tiresome, and which only occasionally requires a short and powerful effort, whilst the opposite is true on long hauls and on continuous adverse grades. As compared to a tractor animals are handicapped where they cannot get proper footing, such as on loose ground and in swamps, and also in heavy work where several animals must be used together, since much energy is then wasted due to lack of simultaneous action.....
>
> Studies of logging operations where horses and tractors work under identical conditions, indicate that the ratio between the efficiency of horses and tractors varies within wide limits, although in hauling, one horse is equivalent to 2 or 3 tractor draw-bar H. P. This is due to the ability of a horse to increase its pull for a very short distance and for a very brief period from 3 to 4 times its normal for continuous work, whilst the

margin between the rated draw-bar H. P. and actual maximum for tractors is comparatively insignificant. On the other hand, a tractor develops its normal power for any length of time, whilst animals, especially under adverse conditions, become fatigued, and then decrease their pull below normal in addition to utilizing part of the working time for rest. Large tractors are preferred to small ones..... However there are about as many 5-ton as 10-ton tractors used in logging and some loggers believe they are more efficient for short distances. The 2-ton crawler tractors, although sometimes used in the forest, are too small for most kinds of logging work."

If allowance be made for the use of elephants instead of horses, and for the more adverse conditions in respect to climate and facilities for repairs, it should not be difficult to form an opinion as to where tractors can and where they cannot be usefully employed in a country like Burma.

Logging practice in the East is severely handicapped by the fact that most of the manual work in the forests has to be done by very unskilled labour of a very temporary character. The average wood-cutter is conservative to a degree. He does not take kindly to new ideas and he does not appreciate the value of co-operation. It is therefore very uphill work to try and introduce new methods and appliances however simple. Country axes are still preferred, and although the peavey is a wonderfully efficient implement of next to no cost, it has not yet come into general use either in India or Burma. What chance therefore have big and expensive machines such as skidders? Given the head of a concern keen on mechanical appliances trial may be made but the chances are that the effort will be short-lived. A private firm may be assumed to be the best judge of its own interests, but nevertheless the thought arises that it would pay to have a larger proportion of men in the logging industry in the East with a good knowledge of the best that America and Europe can teach them of improved methods of handling timber. A young assistan may start with plenty of ideas, but he soon loses his enthusiasm from lack of encouragement from above,

The book is divided into four parts and covers 556 pages. Part I contains a very condensed summary of the book, and had better be read last by the student outside America. Part II deals with felling and logging proper. The two chapters on labour and camps may not be of much interest to readers in the East, but the two chapters on tools and conversion into logs are well worth careful study. Part III deals with transport by land. In the introductory chapter (page 123) the subject is discussed under two heads, *viz.*, Secondary, or short distance, and Primary or long distance transport. The choice of terms is rather confusing. As short hauling from stump generally comes first, it would have been preferable to have called it the primary operation. Part IV deals with transport by water. The description of Ocean Rafting (page 427) is worth serious consideration by the Government of Burma, as was pointed out by the writer in 1919. There is money in the idea of towing rafts of teak logs across the Bay of Bengal for conversion in India.

The writer has nothing but praise for the book as a whole. An attempt is made to describe the various methods of transport in their logical sequence. Operators in the East, both large and small, might do worse than study the book in detail, that is if they are prepared to admit the possibility of improvement in their methods of logging.

But when all is said and done, we come back to the inherent conservatism of the East. The recent change in the form of Government in India and Burma has retarded developments in the timber trade rather than otherwise. No big scheme of departmental extraction appears to stand the slightest chance of being undertaken. The tendency is all to leave everything to private enterprise, a policy which, in Burma, means leaving it all to a small number of big monopolists. Profits from teak are so great and certain that most firms in the trade decline to touch other timbers, and so the trade in them is slow in development. There are two exceptions and the firms concerned deserve every encouragement.

F. A. LEETE.

EXTRACTS.

THE MANUFACTURE OF CUTCH IN NORTHERN SIAM.

Cutch or *Sisiat*, an extract from the heartwood of a small to medium-sized tree (*Acacia Catechu*, Willd., var. *catechuoides*, Prain), locally known as *Mai Sisiat*, is manufactured throughout Northern Siam. This industry is probably of ancient date; in the neighbouring country of Burma it was well established in the sixteenth century; even then Pegu cutch was being exported; no doubt it was also being manufactured in Siam at that time. It is interesting to note that the first cutch to reach Europe went by way of Japan and, as it was considered to be a kind of earth, was named *Terra Japonica*. Gambier, the product of quite another plant, reached Europe about the same time and was called *Terra Japonica* indiscriminately with cutch, and hence arose a confusion between the two substances which lasted many years.

Some of the cutch manufactured in Northern Siam is exported to Bangkok; that consumed locally is used almost entirely for chewing with betel; recently, however, the Siam Industries Company have been using it for dyeing and tanning leather.

The cutch tree is found in all the provinces of Northern Siam but Chiengmai produces the most cutch as the tree is more plentiful there. In some districts, more particularly in the Nan neighbourhood, the tree is planted; elsewhere most of the cutch is obtained from wild trees.

Several kinds of cutch are on the market, the three chief varieties being:—

1. *Sisiat deng*.
2. *Sisiat dam*.
3. *Sisiat poi*.

Varieties one and two differ in colour, the first being the darker and considered the more valuable. This difference in colour depends on the colour of the heartwood, *Sisiat dam* being the product of trees with a very dark red heartwood, while *Sisiat deng* comes from trees with a heartwood of a lighter colour. It

is said that the trees with the darker heartwood usually have the young leaves of a reddish tint, this tint not being found in trees with a lighter heartwood. However this may be, the cutch manufacturers are often unable to predict the colour of the heartwood before felling the tree. Other differences in the trees are noted, thus those with numerous thorns are known as male trees and those where the thorns are scanty or absent, as female trees. Such differences do not seem to be associated with any differences in the quality of the cutch produced.

The third variety of cutch, *Sisiat poi*, is of inferior quality, brittle and porous, and is obtained from the heartwood of dead trees. It is seldom made, as the cutch is more difficult to extract from such trees and the price it fetches scarcely repays the manufacturer for his labour. The cutch extracted from the heartwood of cutch-tree roots, known as *Sisiat rak*, is a less important variety; it is very dark and rather brittle.

Cutch is manufactured almost entirely in the dry season because then there is but little other work to be done and the stages of manufacture are more easily completed in dry weather.

In the preparation of cutch the heartwood only is used, such heartwood being found in the trunk, larger branches and roots. This heartwood is cut up into very small chips, the smaller the better. These chips are put into a large iron pan, in the centre of which is a cylinder of bamboo wickerwork open at both ends. Round this cylinder the chips are packed and the pan is then filled with water until the chips are covered. The object of the cylinder is to facilitate the inspection of the watery extract resulting from the cooking process which follows and to enable the same to be bailed out without disturbing the chips. The pan is now put over a fire to simmer for some hours. When a sample of the extract taken from the cylinder in the centre is considered to be a sufficient depth of colour, all the extract is bailed out and poured into a second and similar pan. Fresh water is poured over the chips in the first pan and the contents boiled again. When the boiling is completed the extract so obtained is also transferred to the second pan. After two boilings the chips are usually considered to be exhausted and are thrown away but

occasionally they are boiled a third time. The second pan, containing the liquid extract from the chips, is now subject to a prolonged boiling, lasting for one or two days, with frequent stirrings, until the liquid becomes thick and will only just drop from a stick. This thick, syrupy extract is then set apart in the shade to dry. Usually it is placed in dishes or tins but often these are dispensed with and it is deposited in small lumps or masses on the surface of leaves. The drying process takes from five to ten days or longer, the length of time depending chiefly on the size of the masses of cutch. When dry and hard the cutch is ready for the market.

Adulterants are occasionally used, either to deepen the colour of extract or to increase its quantity. Rice-flour, fine clay and the powdered bark of *mai machok* (*Schleichera trijuga*, Willd.) are the chief adulterants for increasing the quantity. They are mixed in after the final boiling and before the cutch hardens. These substances are fairly easily detected on tasting the cutch. The barks of two trees *mai du* (*Pterocarpus macrocarpus*, Kurz) and *mai kawo* (*Butea frondosa*, Roxb.) are used for deepening the colour of the extract; when so employed, dried fragments of these barks are mixed with the *Sisiat* chips before boiling.

The price of cutch varies from year to year and also according to quality and season, being cheapest in the manufacturing season and dearest towards the end of the rains. In 1921, best quality cutch fetched Tcs. 6 to Tcs. 7 a *mûn* in the manufacturing season, rising to about Tcs. 12 in the rains. Poor qualities may only fetch half these prices.

Some years ago a sample of Chiengmai cutch was sent by the Royal Forest Department to the Forest Research Institute, India, for analysis and an opinion as to its commercial value. The results were as follows:—

ANALYSIS.

Moisture	13·77 %
Ash	5·54 „
Total soluble solid...	67·40 „
Insoluble in water at 98 C.	13·29 „
Total ...	100·00

Non-tannin	21·30 %
Tannin	46·10 „
Catechin	29·32 %
Absolute alcohol extract	82·62 „
Insoluble in alcohol	3 61 „

REPORT.

"From its composition, it is clear that the Cutch is of an average composition and will do as a dye, though it is doubtful if its deep colour will permit of its being used as a tanning agent. It should be classed as "Solid Burma Cutch," which is generally used for dyeing fishing nets in England. In India similar cutch, under the name of "Red Katha," is sold for edible purposes."

——:o:——

A good deal of research work has been done in India with the object of discovering the best and most economical methods of manufacturing cutch. Sir George Watt in "The Commercial Products of India," gives a useful summary of this work with the chief recommendations resulting therefrom, they are:—(1) That copper pans should be used for boiling the cutch; the use of iron pans is wasteful as the iron of these pans precipitates or alters a certain proportion of the active principles of the cutch. (2) That the heartwood should be reduced to shavings with a carpenter's plane before boiling; this results in a much higher yield of tannin and catchin than is the case with chips; the amount of water used with shavings can be lowered to ten times the weight of wood and the boiling can be shortened to half an hour. This reduction of the wood to shavings means not only a great saving in the time of manufacture but it also leads to the production of a superior extract.

The cutch tree yields, in addition, a gum which is a good substitute for Gum Arabic and in India this is collected and is put on the market as "Indian Gum Arabic." Durable timber and a good charcoal can also be obtained from the tree but its chief commercial value lies in its yield of cutch.

Pegu cutch, which is very similar to Siam cutch, forms over 90 °/ of all the cutch exported from India. The amount and value of Pegu cutch exported before the war, fluctuated considerably from year to year. In round figures the annual amount was from 50,000 to 100,000 cwts. and the value from Rs. 15 to Rs. 21, a cwt. On the whole, both the amount exported and the value have shown a downward tendency.

It is probable that the deep colour of Siam cutch demanded by the local market could be reduced for a foreign market, in which case it should find a ready sale outside this country. If however, the production of cutch is much increased, it would be necessary to make plantations of the tree as there are not sufficient wild trees to supply a larger demand than exists at present. Planting should offer no difficulties as the tree does well on dry, sandy soil, unsuitable for most other cultivations.—[*The Record.*]

CORRESPONDENCE.

PORTABLE JUNGLE SAW-MILL MACHINERY.

SIR,—I should like to make a reference to the article "Machinery for jungle sawing in India," by Geoffry Ransome which appeared in your issue No. 5, Volume L, May 1924.

Though this article contains much useful information and advice, at the same time there are several discrepancies which might prove to be misleading.

It is noticed that Mr. Ransome recommends for breaking down irregular-shaped logs, the American type of circular log mill with friction feed and cable drive to the log carriage. This kind of machine is not common in India, I understand, and I am particularly interested in it as one has recently been installed in one of the Government saw-mills in Bombay Presidency. I do not think there is much objection to the timber frame-work

provided really seasoned timber is used. One of the chief difficulties which has been experienced with the machine in question, is with the track which is apt to sink, particularly over the portion leading up to the saw. The sinking was due mainly to the bumping of the logs when being rolled on to the carriage. The foundations consisted of baulks spaced about 5′ apart. Great care is required in bedding these cross-pieces The earth should be excavated to the same depth and the pits filled with rammed boulders and a top surfacing of mud concrete given. I think perhaps a steel carriage in place of the wooden frame would be an improvement.

The machine in question is of American make and of standard design. The feed-speed, though variable, possessed a range of variation suitable for sawing soft woods and too high for Indian hard woods. This difficulty was overcome by redesigning the bevel-drive on the saw spindle (this bevel-drive can be seen in the small sketches in Figs. 1 and 2 of the article). The modified speed thus obtained was about 19/32 of the original standard speed. This has made a vast improvement.

The above is a very important point when ordering this type of machine as the rate of feed is proportional to the speed of the saw itself. There is, of course, a range of variation due to the variable friction feed, but it is essential that the average required rate of feed should correspond to the mean position in the range of variability thus allowing of the maximum variation up and down. It is therefore essential that the feed drive, whether on the friction disc or slip-belt principle, should be designed to suit the hardness and size of the timber to be sawn. In other machines recently purchased by the Bombay Government, this feed-drive has been specially designed.

There is however a type of friction-feed in which the primary drive of the feed is from a disc instead of a bevel. This allows of very easy adjustment but is only fitted on the smaller sizes. This kind I have not tried personally, but am inclined to think that it might not be suitable for heavy cuts in hard wood. In the modified machines above-mentioned, I allowed of a variation

of from 5 to 75 feet per minute which corresponds closely with Mr. Ransome's recommendation of 10 to 80 feet per minute.

Mr. Ransome has referred to the use of inserted-tooth instead of ordinary solid plate saw blades. I understand these have been tried in Government mills in some Provinces and I should be grateful for any information on this point, based on actual prolonged use in this country. What may be a success in Europe might be a failure in India.

Mr. Ransome, I notice, recommends a self-acting drag-feed for the machine for secondary conversion. I have observed that in all cases in jungle mills where circular saw benches have been fitted with automatic drag-feed, the use of the latter has been invariably discarded and ordinary manual pushing resorted to. One of the most successful and simple devices I have seen was a rope feed from a rough windless turned by a cooli. The rope was attached by a hook-spike which was driven into the timber, the windlass being situated about 25′ or 30′ behind the bench and in line with the saw.

For jungle saw mills operated by unskilled workmen, I do not think the automatic-feed circular saw bench advisable. For heavy material a sliding table is an advantage in some ways, but it has the disadvantage that the benchman cannot get immediately behind his work to push. Fairly big stuff can be handled on the ordinary circular saw bench with the help of the usual trolley.

Mr. Ransome has referred to a saw-sharpening machine. One is, of course, essential and the usual form is the hand-operated type of gulleting machine. In two of the mills in this Presidency, automatic saw-sharpening machines have been installed and there is no question that by their use, the output can be greatly increased, and the standard of sawing improved. The action is so much quicker than with the hand machine, that saw blades can be returned for sharpening more frequently before they get dull. This means faster and more accurate cutting and obviates heating and possible buckling of the blades, both due, mainly, to badly-sharpened or dull saws. Furthermore

the saws maintain absolutely correct diameter, balance and tooth profile. The automatic machine of course requires some care in keeping it properly adjusted.

Mention is made in the article under reference of ball-bearings for saw spindles and I should like to contribute my support to this kind of bearing in place of the more usual gun-metal plain bearing. In a Government saw mill in this Presidency recently erected, all the machines are fitted with ball-bearings. The machines were supplied by Messrs. A. Ransome & Co. and after 1½ years continuous running, show no sign of wear, whereas machines with ordinary plain bearings are a continual source of trouble and expense in refitting and renewal. Ball-bearings are particularly suited to high speed machinery, absorb far less power and cost much less in lubrication.

Mr. Ransome deals with the question of the gauges of saw-blades and gives a table of gauges recommended for hard and medium woods. In the Government mills in this Presidency, with teak as the principle timber being converted, it has been found that blades of thickness a gauge thinner than those recommended by Mr. Ransome are working quite successfully.

As regards the output of mills, I am afraid that the figures given in the article under reference are decidedly optimistic, at any rate, from experience in this Presidency. For hard woods the contributor gives the output for a mill described by him as from 3,000 to 4,000 c.ft per week of 50 working hours. Such figures have never been obtained with teak in the Government mills in Bombay. The most recently erected mill which is being as efficiently run as is possible under the conditions has been worked up to an outturn of 250 c.ft. per day, *i.e.*, 1,500 c.ft. a week of 50 hours, converting small teak logs into small scantlings and market sizes.

His estimated cost is also rather on the low or optimistic side. The following is an estimate for the saw mill shown in Fig. 1 of Mr. Ransome's article. The figures are from recent quotations and current prices and those for freight, carting and erection are from actual experience. The rail journey was 172

miles and the jungle road journey 19 miles. The value of the timber used in the mill building is not included :—

	Rs.
Portable engine, machines, mill gearing ...	19,700
Saw blades	1,560
Tools and equipment	220
Corrugated iron sheet roofing	1,000
Erection, labour and stores	1,700
Carting charges	1,500
Railway freight	2,000
Total ...	27,680

This does not include a water-supply system consisting of hand pump, 800 gallon wrought iron tank, $\frac{3}{4}''$ galvanised iron piping, bends, taps, cocks, etc., which would cost from Rs. 250 to Rs. 800 according to the type of hand pump installed.

The amount shown above is equivalent to £1,900. The figure of £1,400 would therefore appear to be an under estimate if all contingent charges are to be considered.

A subject which requires investigation and which has not been touched upon by Mr. Ransome is that of the correct cutting speeds for various Indian timbers under portable mill conditions. I have found that speeds derived from theoretically correct periphery speeds for European practice are not to be recommended, practically in portable mills of this kind, for several reasons. At the same time I have observed that the tendency in mills left to look after themselves is to run the saws too slowly. I give below a table showing the theoretical saw speeds and those found by experience in our Government portable saw mills to give good results.

Diameter of saw.	Theoretical speed. R. P. M.	Speed adopted in Bombay mills. R. P. M.
60" ...	640 ...	450
54" ...	715 ...	540
48" ...	815 ...	650
42" ...	935 ...	780
36" ...	1080 ...	980
30" ...	1280 ...	1180
24" ...	1630 ...	1500

This represents a decrease below the theoretical speeds ranging from 30 to 7½ per cent.; the periphery speeds are still further reduced as their diameters decrease with sharpening.

The layouts of the two mills reproduced in the article are misleading and indeed obviously incorrect.* The main points to which objection could be raised are, Fig. 1 (Plate 9).

(1) The 54" log mill is arranged the wrong way round and would have to work backwards. As drawn, the carriage must move from right to left and not left to right. This is clear from the positions of the saw guide and riving disc. Also as arranged the benchman has the log coming towards him instead of going away from him. As arranged he could not line up the log and regulate the cut without going backwards and forwards over the machinery of the husk. The skid way is so arranged that the log would have to be lifted over the back of the headstocks and lowered on to the carriage, a process obviously impossible. Furthermore, to get a log on to the skids, it has to be rolled up the ramp shown in the upper drawing and then turned through a right angle on the log-platform. This is impossible with heavy logs.

* Mr. Ransome has drawn our attention to the errors in the layouts illustrating his article and has provided revised drawings to replace both originals. Owing to postal delay the blocks are not yet available, but we hope that they will be used in an early number.—HON. EDITOR.

With the arrangement shown, the heaviest drive, *viz.*, the log breaking-down mill is at the extreme end of the main shaft which should be avoided, if possible.

(2) The roller table for the swing cross-cut saw is so arranged that the sawn material has to be removed from the end of the saw carriage instead of from the side in order to get it on to the roller table. The dead roller way should start along side and not at the end of the saw carriage and pass along under the pendulum cross cut saw, *vide* rough sketch. The drive for this machine from the overhead shaft is about 6′ 6″ which is too short.

(3) The sawn material then goes back through the 36″ single-edging machine. After this the material cannot be taken forwards out of the mill as the log platform, 3′ high, is in the way. It therefore has to be taken back again and round the other side of belt drive of the machine.

(4) Material to be still further converted goes through the small 24″ bench. The material from this bench cannot be taken out forwards owing to the log platform but has to be taken back the way it came as there is no passage to the right owing to the main drive belt from the engine.

(5) Incidentally the engine is placed so that it would have to work in what is recognised to be the reverse direction.

(6) It will also be seen that 3 out of the 5 machines have cross-belt drives which is objectionable.

(7) Some of the line shaft pulleys are of most unusual dimensions and not to the standards on the market, *e.g.*, 19″ × 4½″; 47″ × 13″; 47″ × 17″; 18″ × 4½″. These not being standard sizes would have to be specially made.

(8) The belt drives for the machines are distinctly on the short side. Short drives necessitate tight belts and

thereby extra wear on saw spindle and loose pulley bearings.

(9) The roof slope is continuous over the mill and the engine house. This design necessitates unnecessary height. The posts supporting the roof would be 14′ long above the ground. The engine shed should have a separate gable roof as indicated in the sketch attached.

Apart from the details, I am afraid this layout would prove very inconvenient as it would lead to congestion of sawn material, waste material, etc., which is one of the chief factors that interfere with saw mill output and efficiency.

Now referring to Fig. 2, Plate 10, which illustrates a second proposed layout:—

(1) The engine is running in reverse direction.

(2) The feed of the 54″ log mill is the wrong way, *viz.*, so that the log goes over the riving disc before the cut instead of after. The benchman is on the wrong side to work the machine and also to attend to the lining up of the log on the carriage and regulate the cut.

(3) The logs for this machine are rolled up a ramp turned at a right angle on the log platform. From here the posts supporting the roof, which would be 10′ apart or 12′ at most, prevent the logs being got on to the skids. From the skids the log has to be lifted 4 or 5 feet high, over the back of the headstocks to get it on to the carriage.

The 54″ log mill is drawn in the wrong way round and if this be rectified, the layout with the engine between the two machines becomes an impossibility as a little study of the drawing will reveal.

Personally I have never seen a portable engine driving direct on to two machines each with fast and loose pulleys from two fly wheels. The arrangement may be sound, but I doubt it. An 8″ belt is required for the 54″ log mill drive and that means an engine pulley of 17″ face width at least. Such a pulley would

probably be too heavy for the crank shaft of a 40 B.H.P. portable engine. There is no provision for a saw sharpening machine in this design. This layout, therefore, is very misleading, and as it stands impossible.

[NOTE.—*Since writing the foregoing remarks on the saw mill layouts shown in Figures 1 and 2 of the article under reference, it has come to my knowledge that the plans were incorrect as the result of a mistake by the junior draftsman. I have seen advance copies of the revised layouts but as these have not appeared yet in the* "Indian Forester" *I have left my notes as originally written. Some of the remarks do not apply to the revised plans but most of them do.*]

From a study of saw mill practice, as far as I have been able to pursue it, I am convinced that one of the first principles should be that the log comes in at one end and the sawn material goes out at the other end of the mill.

In small mills this is not always rigidly possible, but the change of direction of the material through the mill should be avoided wherever possible and kept to the minimum. Another important point is to arrange the machines so that light tramway, of say 24″ gauge, can get up to or near each machine and one through line also, if possible, to allow of the trucks being moved and exchanged from the log depôt on the approach side to the exit side, *i.e.* sawn-timber stacking ground or seasoning-shed side.

I attach a sketch of a layout for a saw mill, which though by no means perfect, I have found to possess many good features. In small mills where machinery and mechanical power are maintained at the minimum, it is impossible to avoid every inconvenience.

This saw mill includes the following machines and equipment:—

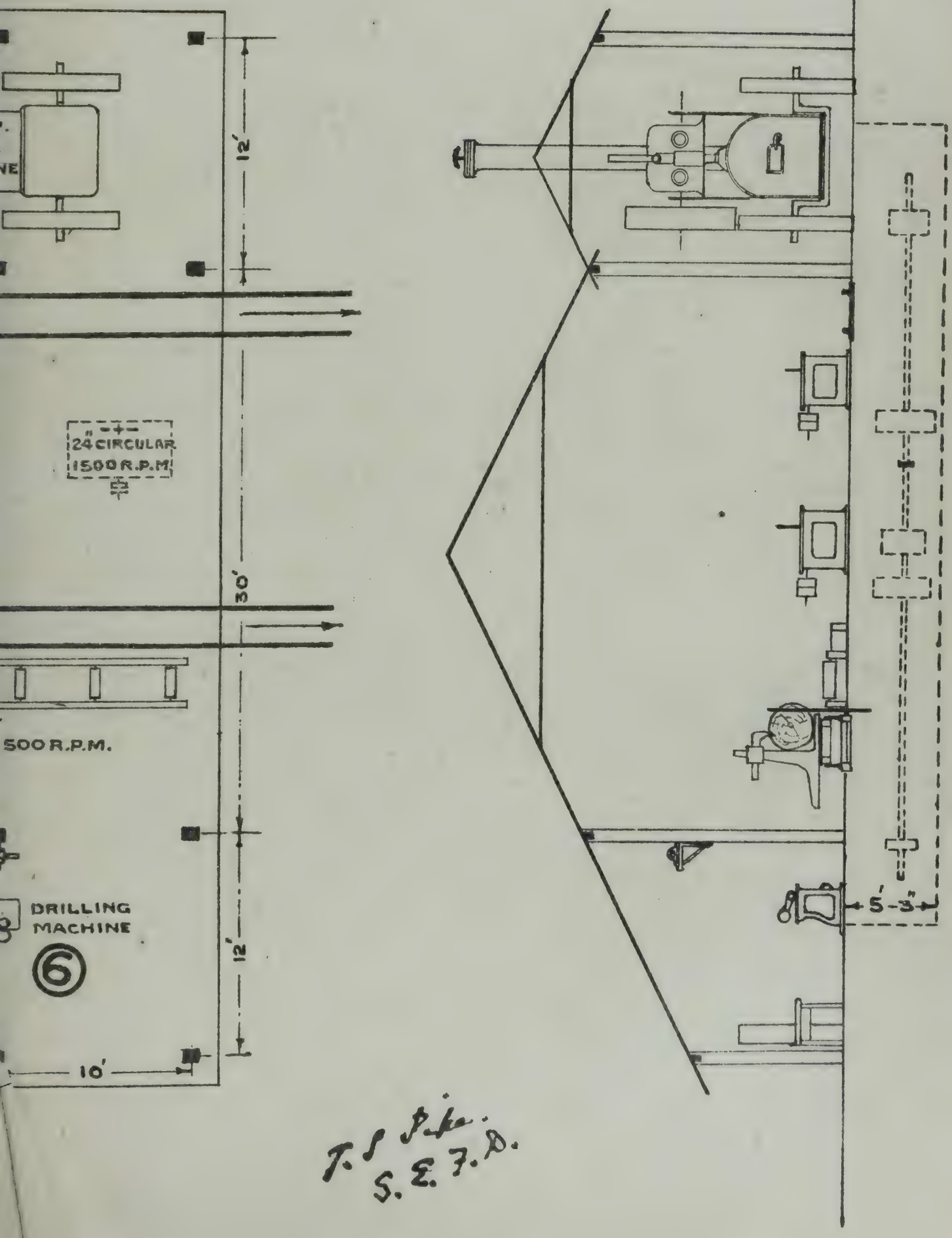
One—20 N.H.P. Portable steam engine.

One—American or Canadian-type circular log-mill with variable feed and cable-drive (1 in sketch).

One—42″ diameter plain circular bench (3 in sketch) or 42″ diameter bench with hand sliding table.

PLATE 2.

MILL



T. I. Pike.
S. E. T. D.

One—30″ Plain circular saw bench (4 in sketch).

One—30″ Pendulum cross-cut saw (2 in sketch).

(NOTE.—All circular saw spindles should be fitted with ball-bearings.)

One—Hand-gulleting machine or Automatic saw-sharpening machine if properly looked after (5 in sketch).

One—Drilling machine (6 in sketch). This is shown with power drive in the sketch. A hand-power post drilling machine would suffice.

One—Saw-setting apparatus for spring-setting the teeth of saws by the hammer. (Messrs. A. Ransome & Co. manufacture this type of apparatus).

One—Line shaft of 3″ diameter. (The use of 3½″ diameter shaft is a wise precaution as this shaft is liable to greater strains in a portable mill than in one of more permanent erection.)

One—Overhead shaft 2″ diameter. The shafts are fitted with long ring-oiling bearings and carry wrought iron split pulleys of required diameter, face, width and bore.

One—Fitter's bench with vice. This should have a wooden clamp or vice for holding hand cross-cut saws for sharpening. A few hand cross-cut saws are usually required in a saw-mill depôt.

One—Dead-roller-way for conveying sawn material from the log-breaking-down mill to the pendulum cross-cut machine.

One—Log platform or skid.

One—Skid for material for the 42″ and 30″ circular benches. With these skids, the long members may have light section rails spiked on to the top of them. This facilitates the sliding or rolling of the material considerably. One or two circular saw racks or horses in the tool-shop. In addition, the usual tools such as ratchet drill,—hammers, chisels, punches, squares, spanners, etc. etc.

One—Tool locker.

The general *modus operandi* would be as follows :—

The logs come in from the mill log depôt on low trucks and are unloaded on to the log skids or platform and rolled into place near the 54″ log-mill. If the logs are lying near the mill or when a special log has to be brought in when the log deck is already full, it is sometimes an advantage to be able to bring it in direct to the log-mill. For this, a length of tramway is shown coming along side the carriage of the log-mill and to render this possible the end portions, of the skids are hinged as indicated on the sketch.

In machine No. 1, the log is slabbed, on one, two or three faces, squared or sawn into desired widths. These slabs are then either taken by the dead-roller-way and cross-cut to length in machine No. 2 (this operation would not be done always) or goes to the timber skids where it is dealt with by the circular saw benches Nos. 3 and 4.

As regards the pendulum cross-cut saw it is a good plan to support it overhead on several packing pieces of thickness. These can be removed one by one when the machine is required to be lowered owing to the reduction in the saw diameter with sharpening.

Timber not dealt with in machine No. 2 can be cross-cut in either of the Circulars Nos. 3 or 4. It is however more convenient, usually, to cross-cut all long pieces on the pendulum cross-cut saw No. 2.

Machine No. 4 can be used conveniently for cross-cutting fuel billets for 15 or 20 minutes during the dinner hour or after working hours in the evening.

For normal working, log-mill No. 1 can keep the benches 3 and 4 supplied with slabbed material by working about $\frac{2}{3}$rd of the day. For the remaining time, it can be employed for complete conversion of large sizes. Such material would leave the swing cross-cut-machine No. 2 direct to the store shed. In the above design, the heaviest torque is kept as near the engine as possible. An extra plummer block and bearing to the main shaft might be advisable.

I estimate that a saw mill of the kind described above would cost complete and erected Rs. 30,000, and if run with moderate efficiency could be relied upon for an outturn of 250 cubic feet per working day of 8 to 9 hours, on straightforward work of sawing stock sizes in teak or similar timber.

With a mill of this kind turning out 250 c.ft. of sawn timber per day, the labour costs should range between Re. 0-3-3 and Re. 0-4-0 per cubic foot including handling of logs and sawn material. This is reckoning on the following rates for labour :—

Foreman	Rs. 170 per month.
Fireman	„ 30 „ „
Carpenter	„ 45 „ „
Smith (half time)	„ 45 „ „
Storekeeper and clerk... ...	„ 45 „ „
Saw sharpener	„ 35 „ „
Coolies	Re. 0-7-0 to Re. 0-8-0 per day.
Hand cross-cut sawyers ...	Re. 0-8-0 per day.

An extra 24" diameter circular saw bench might be found advantageous. This could be accommodated beyond and between machines Nos. 3 and 4 near the end of the mill (shown dotted in plan) and run from a small under-ground counter-shaft. The engine has ample power to meet this. A reserve of power is always advisable. The position of the timber-skids (not log-skids) should be regulated to suit the length of material being sawn. For long timber, it should be set 4' to 6' further back than shown in the drawing to allow of more space behind machine No. 3. There is ample room for this.

In that case, the saw carriage track would, of course, be extended also. The heights of the log and timber-skids require careful adjustment since the log-mill carriage is only about 1' 0 to 1' 6' above ground level whereas the tables of the circular saw benches stand 2' 6" high usually. The log platform shown in Mr. Ransome's design is 3' high which is quite unnecessary. In fixing the height of the log platform, the height of the log-mill carriage and that of the truck bringing the log into the mill have

to be taken into consideration. High log platform means a raised tramway level, which is objectionable. The slope at the ends down to the log-mill carriage level should be very slight, if any, as it is advisable to have the log absolutely under control and to put it on to the log carriage as gently as possible. With a sloping skid the log is apt to roll against the headstocks and subject the carriage to unnecessary shock. It is advantageous to site the mill so that there may be a down slope of from 1 in 70 to 1 in 100 through the mill. This assists in bringing in the logs and in taking the sawn timber out.

As regards track, I recommend 24″ gauge throughout. The section should be 18 lbs. per yard which, though slightly on the heavy side, keeps its shape better than lighter sections. The trucks should have axle boxes with roller-bearings which look after themselves far better than brass or cast iron bearings. Ordinary steel disc wheels, 12″ diameter (fixed on axles) with inside journals. The wheel base of trucks should be kept as small as possible so that standard size turn-tables can be used. The latter can be purchased in several varieties but are readily made by riveting rail lengths on to ⅜″ thick steel plate and providing a suitable pivot pin and wooden frame.

There is no doubt that the lay-out above suggested is by no means perfect, but a saw mill on these lines is being found successful in actual working. The kind of timber dealt with and the sizes of sawn material turned out affect the design both as regards the machinery to be installed and the plan of lay-out.

T. S. PIPE,
Superintending Engineer, Forest Department,
Bombay Presidency.

THE NORMAL *SAL* SELECTION FOREST.

SIR,—It is unnecessary for me to reply in detail to the whole of Mr. Trevor's letter in the December number, as much of it is fighting wind-mills. If he wishes to compare an existing growing stock per acre with that of a *uniform* forest of one acre, he achieves his object and this has never been questioned.

The mathematical portion, in what I fear will be obscure language to some, again calculates from a yield table of a uniform forest the growing stock for all sizes of that uniform forest collected on one acre, and then again announces that it is the same as a selection forest. Despite, therefore, the "mathematical symbolism" of that intriguing little formula with the saxophone in the middle, it has nothing to do with the main issue which is whether the normal uniform forest *is* the same as the normal selection forest.

The real arguments in support of Mr. Trevor's contention that the normal selection forest and the normal uniform forest are the same thing as regards number of trees and only diffe in distribution are contained in the first two pages. I did not "deny that the diameter class distribution in a selection forest is the same as that for uniform forest." Till some proof is brought I prefer not to *assume* they are the same, but if anyone will bring any proof that they are identical that would settle the matter.

What proof does Mr. Trever adduce? Absolutely none!

He says "until it can be proved to the contrary it is accepted that "**r**" acres of normal selection forest will have the same number of trees of each age (as the normal uniform forest) but completely intermingled equally in every acre"—and—"I (Mr. Trevor) accept the statement until the contrary has been proved that the silvicultural system employed makes no material difference to the theoretical conception of the normal forest." Is any unproved statement accepted till someone disproves it—even the above which apparently attributes the same normal growing stock to coppice, coppice-with-standards, uniform forest, selection *et hoc genus omne*? I fear I prefer the reverse method, that no statement be accepted till at any rate some likelihood of its truth is brought forward.

Schlich, Volume III, is then quoted as follows: "The growing stock of a normal selection forest may be placed equal to that of a forest under clear cutting as all the age gradations are

represented in a similar way though differently arranged over the area: hence it can be ascertained by summing up the quantities given in a yield table. *At the same time, the calculation is likely to be less accurate..... . ...*" The words in italics were omitted by Mr. Trevor.

But why believe this guarded statement of Schlich's on page 227 and disbelieve his explicit statement on page 95 where he says "separate yield tables must be prepared for (*b*) each method of treatment," and again on page 170 "The ideal state differs, *of course*, for every different method of treatment?" The last edition of Volume III was published 13 years ago. Schlich has made a more recent statement than that, for in 1923 he wrote in an essay on the Selection Forest, "It is not possible to define the normal state of the growing stock by a formula as can be done in some other systems."

Schlich is not the only one who has grave doubts of the identity of the normal selection and the normal uniform forest nor are they mere statements but are backed by figures.

In the *Allgemeine Forst und Jagdzeitung* in 1913 Dr. Zentgraf gave a great many comparative figures which I cannot quote here but I can give his conclusion. "From the examples quoted it is evident that the selection forest, although it is provided with a smaller growing stock capital, steadily produces proportionately higher yields than uniform forest." Again Kubelka, head of the Forest Research Station at Mariabrunn, with figures to prove his points and many references wrote in 1913 "from these statistics, of which the accuracy is beyond any doubt, the increase in a carefully tended selection forest far exceeds that of an even-aged high forest stand." This hardly looks as if normality was the same under each system. I am not, by the way, advocating a return to the selection system in *sal.*

Need I go on quoting the many recent authorities to show that it is dangerous to accept calmly a mere statement that the normal uniform and the normal selection forest are the same?

And which of the world's famous foresters—except Mr. Trevor—have made this statement in the last 15 years? Whom does he bring forward as an authority? He quotes a guarded statement of Schlich's made years ago on which Schlich himself both then and since has cast much doubt; he quotes Recknagel in a perfectly sound statement but one which has no direct connection with the point at issue, *i.e.* whether the normal selection forest *is* the same as the normal uniform forest, and he mentions Gurnaud who is hardly a modern writer.

The only modern opinion he cites is that of the Swiss. I have not yet quoted Biolley to refute Mr. Trevor's contentions because Mr. Trevor himself has kindly done it for me, so I requote Mr. Trevor. "Indeed the modern Swiss school headed by Biolley has as yet made no pretensions to an exact knowledge of what the normal growing stock under the selection system should be."

Exactly! Surely my first letter was also a protest against a pretension to an exact knowledge of what the normal growing stock under the selection system should be.

"I sayd it: but by lapse of lying tongue,
When furie and just griefe my heart opprest:
I sayd it: as ye see, both fraile and young,
When your rigor had ranckled in my brest,
The cruell wound that smarted me so sore,
Pardon therefore (sweete sorrow) or at least,
Beare with mine youth that never fell before,
Lest your offence encrease my griefe the more.
I spake amysse I cannot it deny
But causèd by your great discourtesie:
And if I sayd that which I now repent,
And sayd it not, but by misgovernment
Of youthful yeares, your selfe that are so young
Pardon for once this error of my tongue,
And think amends can never come too late:
Love may be curst, but love can never hate."

S. HOWARD, I.F.S.

FOOTNOTE.—I must thank Mr. Trevor for pointing out the error in Forest Records, Volume X, Part III. I take this opportunity of calling attention to two more misprints in Curve 9 of that record. On the vertical scale the figure 60 is twice repeated when the lower should be 50 and on the horizontal scale 12 is twice repeated when the figure nearer the origin should be 11. Fortunately these make no material difference to the application of the tables and correction slips are not being issued.

S. H. H.

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(2) THE NORMAL SELECTION FOREST.

SIR,

With reference to the letter of Mr. Trever on the Normal Selection Forest, I think he raises one or two points which are to say the least, debateable.

Early on he asks the question "What is *the* normal forest?" thereby he assumes that there is but one and begs the whole question.

Had the question been put "What is *a* normal forest?" most of us would have been able to give an answer. It is one so constituted as to give a sustained annual yield having regard to the objects of management and the *silvicultural requirements* of the species.

The text-book illustration of a normal forest is that of clear-felling with immediate restocking in one year—a purely hypothetical system; but chosen as it is the simplest one. This should not be forgotten and it is obvious to me that the constitution of a forest under a shelterwood with a long regeneration period, say 20—30 years, under normal conditions must differ from the text-book illustration. A calculation of the growing stock in c.ft. will show this.

Question from standard works are not always to be relied on and in Schlich, Vol. III, Introductory remarks to Part III I find the word "The ideal state differs, of course, for every different method of treatment."

The curve obtained by Mr. Trevor is that of a mechanically mixed series of even-aged woods with enumerations on a sample of 1 acre. I should like to ask the author of that letter to do his mixing a little bit more slowly and to take say 1 acre of even-aged forest 100 years old and then proceed to mix with the stems trees 90 years old. To do this without increasing the area will mean removing some of the 100 years stems and replacing them with those aged 90 years—not necessarily the same number. Then try to mix 80 year stems, by removing stems 100 and 90 years and replacing and continuing the process until the brew is complete. I do not say that this is possible even if we have nice smooth curves of even-aged crops, planimeters or an inclination to introduce the integral calculus notation; but what I do maintain is that the number of stems will not be the guide for correct mixing. Crown-spread and above all the silvicultural requirements of the stems of different ages will require some attention.

The light conditions and the response to any alteration in these conditions due to removal of some stems is so absolutely and entirely different in an irregular crop to those in an even-aged crop that a mixture a la Trevor will, I am certain, not produce a satisfactory and normal forest in the opinion of those who wish silviculture to have a place in the scheme of things.

I am bound to be accused of being wholly destructive and I admit this cannot be helped as until something like a normal (in the silvicultural sense) selection forest has been grown and enumerated. I fail to see how any one can predict its constitution.

I do not object to Mr. Trevor's method of obtaining his curve though integrals are of little help to some and confusing to many. What appears wrong is to call the curve that of the normal selection forest. Cannot some other name be invented for the curve.

As regards its utility I agree with Mr. Howard. It is confined to those who are willing to use it and the whole question seems to be, how far are we to go?

Having plotted the Trevorian curve and the enumerations from actual compartments, may we give up writing descriptions

of the growing-stock and use the little bits of squared paper? Personally I should say No: but may be I have not much faith in mathematical juggling in a science like Forestry, where nothing is fixed and every operation alters the conditions of growth and behaviour of the stems.

C. E. SIMMONS, I.F.S.

A BRANCHED SPECIMEN OF THE WILD DATE PALM.

SIR,—Although the genus *Phœnix* is described as being occasionally branched, I have never before seen a specimen of *Phœnix sylvestris*, Roxb., with a branched stem.

Having recently come upon a specimen which must have had four branches at one time—one of which had evidently been cut off some time ago—I photographed it and send you a copy. In the photograph three branches are distinctly visible and all of them are growing vigorously. (See fig. 1, Plate I.)

I would be interested to know whether other cases of this species having branches have been recorded, and if so are they fairly common in any particular locality.

E. M. CROTHERS, I.F.S.

EFFECT OF FIRING YOUNG TEAK.

SIR,—I quote below a successful experiment which was performed with teak regeneration in a 50-acre plantations called Chikkanji in North Malabar.

The elevation of the locality is ,000 ft. above sea-level, average rainfall is about 90 inches from both the monsoons, soil is loamy, temperature in summer varying from 90 to 100 degrees, aspect south-westerly.

In 1921-22 the area was clear felled, burnt and teak seeds dibbled in 12′ apart in pits 10″ cube. Germination was good, but due to partial neglect and drought the results in the next summer were not very encourging. In September 1923

the casualties went up to about 35 per cent. in spite of the fact that dead ones were replaced from time to time. In December 1923 it was ordered that the plantation should be burnt. Pending the burning of the plantation all subsidiary operation such as weeding, mulching, etc., were suspended. In March 1924, grass and other weeds which had by that time grown up to 7′ to 8′ high were burnt. Teak seedlings were then 6″ to 3′ high. Everything inflammable in the plantation was reduced to ashes in a couple of hours. The leaves of the teak seedlings were all burnt away and the stems also were burnt, some completely and some partially. All the stems after the fire appeared to be dead. These dead stems were then cut flush to the ground and in a week's time a prolific growth of shoots came out from each stump. The shoots were thinned out after a month, keeping the most promising one on each stump. In 3 months' time the shoots reached a height of 1′ to 5′ and now it is 6 months since the commencement of the operations and the shoots are 3′ to 10′ in height showing a very healthy appearance. Thus fire has established a fairly good teak plantation. The casualties that existed before the operation and the few stumps that failed to respond to the stimulus were replaced by stumps of teak seedlings 1 to 3 years old and they are all coming up well. When casualties were counted between the 9th and 10th October they were only 1·65 percent.

T. T. Ansep,

Range officer, N. Malabar.

WORKING OF THE HORNBY CHARCOAL KILN.

We have received the following letter from the Conservator, IV Circle, Madras :—

Forest Utilization being largely a matter of profit and loss, it would be interesting if in continuation of his article in the October number Mr. Crothers would work out and publish for general information, figures comparing the cost of working the charcoal

kiln in question and of burning charcoal as carried out locally. He will, I suppose, take credit for the extra revenue *actually obtained* for the better class of charcoal, but will have to debit transport charges of the kiln, depreciation, and interest on capital, items which are frequently overlooked.

The wood usually converted is generally fresh cut. Is there any information as to what extent the drying of the wood affects the outturn? In the case of green wood a good deal of carbon may be used in driving off the extra water.

DOMESTIC OCCURRENCES.

DEATH.

SILVANUS.—In Edinburgh, as the result of an accident, on 1st November, DAVID HUBERT MILES SILVANUS, late Indian Forest Service, Burma, of 36 Buckingham Terrace, Edinburgh, aged 38.

Fig. 1. In the fir forests of the Pir Panjal, Kashmir.

Fig. 2. A hill tiger shot in the Tharrawaddy district, Burma.

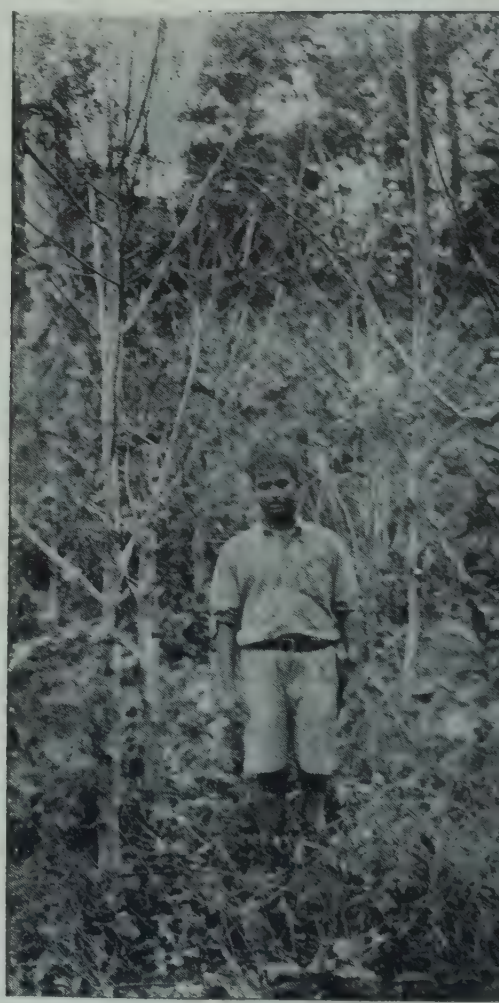

Fig. 3. Defoliation of *Gmelina arborea* *taungya*, November 1924, Chittagong Hi

Photos No. 1 by Sher Singh, No. 2 by E.A.S.
No. 3 by M. C. Chaudhuri.

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THE FIR FORESTS OF THE PIR PANJAL, KASHMIR.

The fir forests in British India have, of late, come into the lime light not so much for their intrinsic or potential importance as for the difficulty of their natural regeneration. It was in 1877 that attention was first drawn towards this question in connection with the regeneration of the Kanjatra block in Jaunsar. Ever since the question has engaged the serious attention of other foresters. Nevertheless, it can be stated without fear of exaggeration that the matter is still wrapt in mystery.

The conditions prevailing in Kulu, which are typical of those obtaining in other fir forests in British India are admirably summed up in the following words by Messrs. Parma Nand and Wright in their Note which was presented to the Punjab Forest Conference, 1922 :—

"In Kulu most of the spruce and silver fir forests are mature or over-mature. Second and third class trees are generally deficient, and reproduction for the most part is conspicuous by its absence. This was so in 1897, when the first working-plan was made and now after the lapse of a quarter of a century the composition of these forests is practically the same. Such is the case wherever these species are found."

In the same Note the authors give probable causes for the failure of regeneration but finally conclude that "whatever the cause, the fact remains, we cannot wait for natural regeneration."

Considering the general gloom which hangs over this question in British India, it will be of interest to outside foresters to

know that the Kashmir Valley appears to be singularly fortunate in this respect. Not that Kashmir is without its 'refractory' or typically bad forests, but such forests appear to be exceptional rather than the rule. There are in Kashmir miles and miles of fully regenerated forest in which regeneration has sprung up literally, 'like a weed,' and without the application of such adventitious aids as hoeing and burning of the leaf-layer. Indeed, it is most gratifying to see the way in which fir regeneration springs up spontaneously over considerable areas of the forest in Kashmir wherever the condition of overwood is favourable for such growth.

Isolated cases of this phenomenon occur all over in Kashmir, but there is, perhaps, no more typical case than that presented by the northern slopes of the Pir Panjal. This Range which forms the southern boundary of Kashmir, and which stands out like a mighty rampart between this Happy Valley and the Punjab, is covered by what are unquestionably among the most magnificent fir forests in India. From whatever standard they may be judged, quality, purity, density, maturity or reproductivity, they are far and away the finest fir forests in India. Even from a spectacular point of view, it is difficult to find a more arresting panorama than that presented by the Pir Panjal with its unending line of forests set in bold relief by a capping of eternal snow, extending from Ahrbal to Gulmarg, a distance of well over 50 miles. The greater part of this forest has never been worked, at least not thoroughly, and is now in a practically virgin condition, but there are some areas which have come rather too heavily under the axe, such as those lying in the basins of the Dudhganga and Shaliganga. And it is these latter areas which provide excellent object lessons in the different kinds of and intensities of marking. It is found that while regeneration is absent or scanty where the overwood is dark, it springs up profusely where there is a reasonable opening in the canopy. The whole of the belt which runs along the foot of the Pir Panjal from Sitaharan on the Sukhnag to Hejan on the banks of the Dudhganga, a distance of about 20 miles, is now one vast sea of regeneration, with little or no break. In many places, as near Sitaharan

the thickets are so dense that it is difficult to find their like even in *chil* or deodar. In other places, *e.g.*, Zugu Kharian, there are extensive stretches of middle-aged crop, uniform, even-aged and very much congested. While in other parts still, all age classes are well represented, such as one might find in normal selection forests in Europe.

On the other hand, the virgin forests near Hirpur in the Rambiara series, are devoid of regeneration even though the forest floor is clean. In such cases, however, it is not difficult to understand the failure of regeneration because the canopy is complete, and it is probable that regeneration will follow the lightening of overwood, as it has already done in gaps and openings.

There are some cases in which the dark overwood is accompanied by dense growth of weeds, namely, *guchh* (*Viburnum foetens*), *nera* (*Skimmia Laureola*), *gandelu* (*Sambucus Ebulus*) and *pohu* (*Parrotia Jacquemontana*). In these wet forests, the regeneration of fir will be probably attended with considerable difficulty, but there is no reason why regeneration operations which have been found so successful in deodar forests in Kulu should not prove equally effective in Kashmir.

Barring these isolated cases, however, one is led to the conclusion that the fir forests of the Pir Panjal appear to be exceptional in that they are far more susceptible of regeneration.

This, however, is by no means the only peculiarity which distinguishes these forests from those in British India. Take, for instance, the proportion of spruce to fir. In British India, spruce may occur pure, but is very often an associate of silver fir. In the latter case, the proportion of the former to latter may be as high as half and half. In Kashmir, however, spruce is scarce; it occurs sporadically in the fir forest, but, on the whole, its proportion seldom exceeds 3—5 per cent. Occasionally the proportion goes up to 10—15, per cent, *e.g.*, in the Surakhnari forests near Hejan, but this is an exception rather than the rule. And even when spruce is mixed with fir, it tries to seek spurs, ridges or edges of the forest. This is just as it should be because spruce requires more light

than silver fir. For the same reason, regeneration of spruce in a fir forest is either absent or markedly deficient.

As against this, it must be noted that spruce occurs in company of *kail*, and it is in these forests that its proportion is fairly high, and it flourishes and reproduces itself with great freedom and abundance. This, for instance, is the case in the Naujan forests near Mithwoin, opposite Hirpur. Further, mixed thickets of *kail* and spruce regeneration very often spring up in Kashmir in shingle islands in the beds of rivers, very much like *khair* and *shisham* in India.

For some time past, it has been generally realised that spruce is more akin to *kail* than to silver fir. The Naujan forests appear to afford a more or less conclusive proof of this affinity. For the right-hand bank of the Rambiara is full of fir, whereas the opposite bank is covered with *kail*. Spruce, in this case, has evidently a choice between this or that bank of the river. And it had unmistakably parted company with fir and positively declared itself for *kail*.

The typical associate, therefore, of silver fir in Kashmir is not spruce, but it is either *kail* (Shopyan) or *kail* and deodar (Lolab), though even in these cases the tendency is to seek out different elevations of aspects.

Still another peculiarity which must be mentioned is the remarkable purity of the fir forests in Kashmir. In British India, the firs are very often associated with oaks, laurels, rhododendrons and a host of other miscellaneous broad-leaved species. Curiously enough, there are no oaks, laurels or rhododendrons in the Kashmir proper, no *Pieris*, *Cornus* or *Ilex*, and little or no *Euonymus*, *Carpinus* or *Alnus*. The dwarf rhododendrons occur as near Gulmarg but even these are absent over a considerable part of the Pir Panjal. The only important broad-leaved species which do occur are the birdcherry, hazel, birch, horse-chestnut and the high-level maple, but even these are very often segregated either to wet depressions or the uppermost limit of tree growth so that the forest itself remains remarkably pure.

Allied to the above is the cognate phenomenon of marked absence of weeds. *Strobilanthes*, for instance, which is such a

pest in some of the fir forests in British India, is for the most part conspicuous by its absence. The same is true of other weeds, *e.g.*, hill bamboos, brambles, *Daphne*, *Sarcococca*, etc. There are no climbers except some stray ivy. The only important local weeds have been already mentioned, *viz.*, *guchh*, *gandelu*, *pohu* and *nera*. Of these, *gandelu* (*Sambucus Ebulus*) and its occasional companions, namely, *Polygonum* spp. and *mogol* (*Senecio chrysanthemoides*) are characteristic of over-grazed areas. *Nera* is generally found on higher elevations *Guchh* is more common and is by far the worst local weed, but the growth of these weeds is limited and it can be stated that, on the whole, weed growth is much less than is usual in these forests in British India.

Lastly, it must be mentioned that in certain places, the fir forests in Kashmir descend to very low elevations sometimes to as much as 6,500′, as near Gratnar in the Lolab.

Differences such as these are by no means ordinary ; they appear to be vital and extraordinary and an attempt to explain them will be made in a subsequent article.

SHER SINGH, A. C. F.,
Kashmir.

SPORT IN BURMA.

The Chindwin rises in unadministered tracts and flows through country where the forest often comes down to its banks from more than twenty miles inland uninterrupted by village or permanent habitation. Down through the cataracts above Tamanthi whence snowcapped Saramati can be seen, past Kalewa with its wild mountain approaches to the Chin Hills of which the summits appear as a series of ledges clear cut against the sky like the teeth of a saw, it winds its way out to the more open spaces before joining the Irrawaddy near Pakokku. The hilliest country is on the right bank where beyond the fertile Kabaw valley the line of the Naga and Chin Hills divides Assam and Manipur from Burma. On this bank are immense blocks of forest 1,000 square miles or more in unbroken sequence containing bison, bear and tiger, sambhur, *gyi* and pig. The hoolock or

tailless gibbon adds his unearthly human-like cry to the chattering and whooping of monkeys of the commoner kinds. The left bank is comparatively flat with considerable forest tracts where *saing* (*Bos sondaicus*), inhabitants for the most part of more accessible and open forests, out-number bison, which delight in hilly almost mountainous country with impenetrable depths and thick cover.

Although bison are particularly numerous and give good heads, they are difficult to come up to in such country, but good fortune took me in the hot weather of 1922 to the Uyu country seven or eight days' river journey above Pakokku. Five miles from the river I pitched my camp in a hastily constructed hut of bamboos, grass and leaves. The same evening at 5 P.M. on the 18th April I came up with a herd of bison. The country above the mouth of the Uyu consists of fairly low forest, and in this particular place and for miles round is level *savannah* grass and stunted *bambwe* (*Careya arborea*) with islets of high forest. The grass had been burnt and was freshly sprouting under the influence of the 'mango' showers, green and tender, such as no bison could resist. The herd stood out sharply in the evening light 16 or 17 in number with calves. I saw two magnificent bulls among the number. So open was the country that I despaired of coming closer, so resting my arm against a small tree took careful aim at about 100 yards at the biggest bull and brought him sprawling down, a second shot rolled him over. The animals were arranged in a sort of procession and broadside on, a most extraordinary thing to happen. When I arrived at the spot, I found by the fallen bull a very young bison calf of the colour of and somewhat bigger than a barking deer, left behind by the herd. The big fellow in his crash had somehow separated the calf from its mother and there it was bewildered and frightened. We shooed him off and no doubt he rejoined the herd, as he ran off in their direction.

The head is a fine one nowhere near a record, but each horn is 27" long and 19" at the base, the corrugations are 6½" and 6" clear and the forehead particularly massive.

I shot a fine boar in the same locality. There is no possibility of riding them here. The remoteness as well as the numerous low crowned trees makes pigsticking out of the question.

The year closed with a most extraordinary man-eating tigress incident. I was out with my conservator and we were camped in the thick forest on the right bank about ten miles from the river. Word was brought in the evening that the tracks of a sambhur had been found near the camp, that there was blood on the tracks and that the sambhur had been sprung upon by a tiger and made its escape. My informant thought that by following up the tracks I should certainly come up with the sambhur and so it proved for after going a short distance I came upon the animal and shot it. It had been nearly hamstrung by the tiger but was standing and moving about when I came up with it. The head was 30" good enough for Burma, but poor as Indian specimens go, nevertheless the stag was a full grown one. The meat was brought back to camp.

The sequel was curious and calamitous. The tigress coming back to look for her quarry, found only the blood and entrails. She accordingly visited our camp and found the meat, and in her famished state would have probably seized it but a sleeping Chin coolie close by proved more tempting. She sprang on and clawed his scalp. At 3 A.M. we were awakened by yelling and firing and guessed the reason before being told. The victim had been dropped at once by the frightened tigress and we managed to dress his wound and attend to him so that he soon regained consciousness and a stiff 'peg' even brought him to his feet, but we made him rest till the morning, when he was carried 15 miles into headquarters and taken to hospital where he quickly recovered.

My *lugale* helped me with the washing, lint, bandages and iodine in a most skilful manner with the aid of a Storm King lantern. It was lucky for the Chin that his skull was not broken.

The next man to be attacked was not so fortunate. It was four days later when she actually climbed into a feller's hut 6' or more from the ground and severely mauled a Burman employé laying bare his brain and fracturing his skull in two places. The

men in the camp 14 in number stacked up the fire and sat in a circle round the dying man and while they were so seated, the tigress came again and sprang on another Burman who fell forward into the fire and was slightly burnt. The tigress over-reaching herself touched the hot embers round the fire and quickly made off leaving the third victim mauled on the head and scratched on the body. He however recovered in hospital. A fourth man was slightly scratched by the tigress in her spring. This happened 8 miles from headquarters while I was further afield. On the next day but one I arrived there and sat up for the tigress with A, a Burma Oil Company geologist. All huts and habitations are raised off the ground in Burma on posts, but even Rest Houses so high at 12′—15′ or more off the ground were heavily barricaded. There was no fresh victim however nor did we who were sitting up get a shot. A dog had been poisoned and sent out from the hospital the day before and left in the bed of the stream in case the animal come that way. About 8 A.M. the next morning we heard a tremendous fusillade and rushed suitably armed to the place of the firing where we found the tigress stretched out in its death agony. It had eaten the poisoned dog and was rolling about on the rocks of the stream-bed in great agony and was despatched by the Burmans with S. G. and ball.

The tigress was an old one with worn teeth and was said to have been lame hence its taking to man eating. She was small only measuring 7′ 10″ from head to tip of tail.

The employés came out in great force, everyone in the neighbourhood was soon there, and their comments were curious. "Ho! a Tamanthi tiger" (*i.e.*, from the Tamanthi District) "look at its front feet" said one comparing the shape and placing of the pads and claws with a human hand. The inbabitants of Tamanthi both men and women, are some of them said to be able to turn themselves into tigers and back again as they wish.

Yet another tiger incident. On the 1st August this year I was out after *saing* with the local shikari in a totally different part of Burma near Sangyi, a Forest village 20 miles East of the

railway in the Tharrawaddy District. We found in one place the ground much torn up and tracks as if tiger and *saing* had been coursing round after each other and avoiding and attacking in fact all the signs of a terrific disagreement between them. There was no blood. (*Kya ga ma kaik bu*) "The tiger did not bite" said the shikari. I went on after *saing*. Imagine my surprise when I saw in open bamboo jungle the tiger going from left to right across my front at 50 yard's distance (measured afterwards). I fired and brought him over. My first shot had shattered his right shoulder, made a mess of his liver and broken the other shoulder. At the first shot he appeared to be propped up against bamboos, at the second he fell. Rather excited I fired a third and fourth which I think missed high and a fifth, when I had come quite close, as a precaution. The first shot was a hollow capped 476 bullet and the other—rather unnecessary—shots were solid bullets of the same calibre. By good luck I had put hollow-capped in one barrel and solid in the other.

The time I shot the tiger was 9 A.M. and it had just left thick cover and was going through more or less open jungle. When I saw the animal first, I got an impression of a reddish animal and for a brief second thought it might be a cow *saing* but almost at the same instant saw the stripes and general shape leaving me no doubt.

I enclose you a photo (Plate 3, fig. 2) of the tiger which measured only 7′ 9″ from nose to tip of tail, but whose skin measured 8′ 7″. It was a magnificently developed specimen of a hill tiger as may be seen in the photo.

E.A.S.

THE DEFOLIATION OF GAMHAR (*GMELINA ARBOREA*) IN THE CHITTAGONG HILL TRACTS, BENGAL.

The *gamhar* is a valuable species in the Chittagong District, Bengal. It is used for planking, furniture, door-panels, carriages, boxes, boats, toys, packing-cases and many ornamental works. It is in great demand at Chittagong. It does not grow straight naturally, but in plantations the growth is very rapid and straight.

From the measurement of a sample plot in Sitapahar Range, Chittagong Hill Tracts, it is found that the average diameter growth of *gamhar* in five years is five inches and height 51 feet. The biggest tree has 7·45″ diameter and the tallest tree is 59·5′ high. If this rate of growth is continued a *gamhar* tree of 6′ girth can easily be produced in 30 years in the Chittagong Hill Tracts.

Encouraged by the rate of growth and suitability of the soil and the ease with which seedlings are produced from seed regular plantation has been started in all the Ranges of this Division. During the rains of 1924, a heavy defoliation occurred in *gamhar taungya* in Kassalong Reserve, which caused the leading shoots of all the trees to dry up and the tree to remain leafless for nearly four months, especially at the growing-season of the plant. The defoliation has caused a heavy loss of increment and specially threatened the further extension of the plantation. The biggest area of *gamhar* plantations is in Sitapahar Range which is still safe, but none can vouch for its safety. Unless some preventive measures are taken it would be impossible to carry on the plantation of *gamhar* in the Hill Tracts though it would be very profitable financially.

Light injury to the *gamhar* leaves was noticed during the rains of 1923; only a few holes were made in the leaves and nothing more done.

In the 1st week of June 1924 after heavy rainfall the beetles appeared on the *gamhar* leaves. After about a week, they laid their eggs on the under surface of the leaves. A whitish net-like thing was found to be deposited by the edges of the under-surface of the leaves, and the leaves coiled themselves up and formed into cells. The eggs remained in those cells and gradually hatched into larvæ. Each leaf was found to contain 4 to 5 cells containing larvæ. These larvæ began to eat up the leaf-parenchyma and within 10 or 12 days ate up the greater portion of the leaves. The part which was eaten first became whitish and afterwards brown. The larvæ were about $\frac{3}{4}$′ to 1″ in length, and after 10 or 12 days turned into pupæ

and remained in that condition for a fortnight, after which the beetle was found on the wing.

It appears that they take about 2 to 2½ months to complete the life-cycle. In September all the insects live in the *Ageratum* growing in the *gamhar taungya*. Some of the beetles also invaded nearby *taungya*, but the attack was not so serious there due to field-crops growing with the plants.

In 1922 and 1923 *taungya* was completely leafless for over 1½ months. One month after complete defoliation no leaves came up and in September those that came out again were attacked by the beetles. This attack was not very serious.

The attack of the beetle stopped in the middle of October and new leaves began to come up in October. In November the defoliated area was inspected and the larvæ were again found to be eating up the new leaves. One special point is noticed that the attack on leaves is less where the growth of *Ageratum* is plentiful and where the *Ageratum* was cut the attack is heavy. The insects are now living in the *Ageratum*, but not eating up any leaves of that species. Fig. 3, Plate 3, shows the results of defoliation in November 1924.

As a result of this defoliation in the 2nd and 3rd year, the growth is stopped very seriously. At Kaptai, the growth of the *gamhar* is as follows:—2nd year, height 12 ft., girth 4 ins., 3rd year, height 10 ft., girth 5 ins.

The Chittagong Hill Tracts Division has extensive *taungya* plantations of *gamhar*, so any control measure about the defoliation of *gamhar* will be highly welcomed by the Divisional Forest Officer, Chittagong Hill Tracts Division.

M. C. CHAUDHURI, I.F.S.,

Chittagong Hill Tracts.

NOTE BY THE FOREST ENTOMOLOGIST.

It appears likely that this insect, *Calopepla leayana* Latr. (fam. Chrysomelidæ) will prove a pest of primary importance to the cultivation of *Gmelina arborea*. It occurs in the U.P., Bombay, Bengal, Assam and Burma, and of recent years we have received records of serious damage in Ataran and Bhamo

Divisions, Bilumyo and Mohnyin Reserves, Katha Division, Burma; North Barojhar Range, Buxa Division, and Kurseong Division, Bengal; Sibsagar and Cachar Divisions, Assam; and at Dehra Dun. The rains broods in Dehra Dun have a life-cycle of about a month, the first brood maturing at the end of July; beetles live on into November but no larval work has been observed later than September.

Until the biology of the insect is studied no remedy can be suggested beyond hand-collection of the very conspicuous beetles during the earliest broods. Control by handpicking or sweep-nets is simple, effective, and profitable in agriculture, and until costs have been proved prohibitive it is unwise to reject such methods in forestry.

THE CULTIVATION OF CONIFERS IN NORTHERN INDIA.

(Continued from *Indian Forester*, VOL. LI, pp. 4—11.)

AGATHIS.—A genus of from 2 to 16 species according to taste.

A. australis, Salisb., the Kauri pine of New Zealand is a clearly defined species whereas most of the others appear to be geographical forms of *A. loranthifolia*. *Agathis loranthifolia* Salisb., variously known as *A. orientalis*, *alba*, etc., was introduced into the Botanic Gardens, Calcutta, in 1798 and is still grown there. The form or species from Queensland, *A. robusta*, Masters, is grown in Ceylon and Bangalore where it does very well. I have seen pot plants of *Agathis* in northern India but do not remember having seen any established specimens. The seeds do not keep well and the trees are usually dioecious so that seed is not easily procured from Indian grown trees. Plants of this genus are therefore rare in cultivation.

CEDRUS.—Four species of which probably only the Deodar has been tried in the plains where it will grow as a pot plant. In Dehra Dun there are a number of specimens of *C. Deodara*, Loud, some fairly large but they are not satisfactory and scarcely ornamental.

GLYPTOSTROBUS.—A genus consisting of a single species indigenous to wet situations in S. China. The only species usually called *G. heterophyllus*, Endl., is based on *Taxodium heterophyllum*, Brongn., but there are several older names, *e.g.*, *G. aquaticus* based on *Juniperus aquatica*, Roxb., Hort, Beng., p. 73, 1814, nomen.; Fl. Ind., III, p. 838, 1832, descrip. Names based on *Thuya lineata*, Poir., and *T. pensilis*, Lamb., also have claims for consideration.

Roxburgh states that this species was introduced into the Botanic Gardens, Calcutta, from China in 1812. Though mentioned by Voigt it was apparently not living in 1842. The tree should grow in Northern India if given a wet situation.

TAXODIUM.—This is the Swamp Cypress of the Southern United States and is the American representative of *Glyptostrobus*. There is only one species with one geographical and one habit variety. We have plants of *Taxodium distichum*, Rich., growing well in Dehra Dun but they have not been planted very long. The Mexican Swamp Cypress, *T. distichum.* var. *mucronatum* was sown in the Botanic Gardens, Calcutta, in 1914. One small tree is still living in Calcutta but it does not seem to be really thriving and is rather lanky. A plant taken to Lahore in 1915 and planted on the edge of an irrigation channel has done very much better. It is about 20 ft. high and over one foot diameter at the base and has just produced its first crop of cones. In Dehra Dun the Mexican form seems to be rather more vigorous than the type. Plants were planted out at the beginning of the rains this year. I was away when the plants were planted but left instructions that they should be given a moist situation. They got it. The plants were put in a large borrow-pit and when I saw them again one was standing in a foot of water and had been more or less under water for 6 or 7 weeks. I do not know if it was ever completely submerged as the two inches of the tip where the leaves showed no deposit of mud may have been new growth. This plant seemed none the worse for its wetting but had not grown so well as another planted in wet mud and only under a few inches of water for some days after every heavy rain.

The Mexican species would be worth trying for ornament in the hills. In Mexico it is said to form forests at 4,500 to 7,500 ft and not to be a tree of swamps. It reaches a height of 170 ft. and a girth of over 150 ft. so should not be planted too close to the Forest Rest House. The Swamp Cypress is grown from seed which if not fresh should be soaked in water before sowing. I have failed once with var. *mucronatum* but got very good germination with fresh seed the following year. *T. distichum* was only sown once and germinated badly. With neither form was the seed soaked in water before sowing. The seedlings and young plants do not suffer from the monsoon in Dehra Dun.

CUNNINGHAMIA.—A small genus of two species one of which *C. lanceolata*, Hook., usually known as *C. sinensis*, R. Br., was introduced to the Botanic Gardens, Calcutta, in 1811. It was apparently not living in Calcutta in 1842. This tree grows fairly well in Dehra Dun as also in the hills, *e.g.*, Simla, Chakrata. It is rather too ragged to be really ornamental. In China it reaches a great size but none of the trees in India look as if they would grow very large. The best trees in Dehra are about 40 feet high by 3 feet girth. They cone freely but as far as I am aware they do not produce fertile seed. The stem is usually surrounded by suckers which may be dug up and used for propagation. It is possible that plants raised from imported seed would give better trees than those grown from suckers. I have tried it once from seed but failed to obtain any germination.

PINUS.—Shaw, "The Genus Pinus," recognizes 66 species and it will be convenient to follow his treatment as regards specific limits and names. A great many species of the genus have been tried from time to time and the following references to species is probably by no means complete.

P. longifolia, Roxb.—This species was naturally the first to be tried and was grown in Calcutta before 1794. Roxburgh writing about 1820 or somewhat earlier, refers to small trees growing at Calcutta. It is the only species now grown in Calcutta where however it does not do at all well. It is the only species I have seen in the plains.

P. Armandi, Franchet.—Sown in Dehra Dun in 1913. A few seedlings lingered on in pots for nearly 2 years without showing any signs of vigor.

P. excelsa, Wall.—Some years ago there were two specimens of considerable age growing in Dehra Dun. They were about 12 feet high, stunted and shrubby in growth. One died and the other was destroyed.

P. canariensis, Smith.—This species has been recommended for India but it is unlikely to be satisfactory. We have a vigorous seedling of it which is now ready for planting out unless, as is possible, it is a natural seedling of *P. longifolia* which has come up in the pot where *P. canariensis* was sown. The two species are so alike that without cones it is difficult to distinguish between them. It is also being tried in the Punjab, in Rawalpindi and Simla Divisions.

P. pinea, Linn., was tried in Calcutta in 1799 and according to Voigt did not succeed.

P. densiflora, Sieb. and Zucc.—This species is, I believe, growing well in Chakrata.

P. sylvestris, Linn., was tried in Calcutta in 1810 but failed. It is growing in Mussoorie, also I believe in Chakrata and Naini Tal.

P. montana, Mill., was tried in Calcutta in 1799 but failed.

P. Thunbergii, Parl.—There used to be two specimens of this species growing moderately well in Dehra Dun but they have recently been destroyed for no apparent reason. They were raised from Japanese seed sent as *P. Massoniana*.

P. nigra, Arnold, better known as *P. Laricio*, Poir.—This species is growing in Simla, Chakrata and Dalhousie and does better than most exotic pines in the Himalaya.

P. Merkusii, De Vriese.—We have seedlings of this species in Dehra Dun.

P. sinensis, Lamb.—Said to have been tried in Calcutta in 1811 and was apparently living in 1842, but it seems probable that the species was actually *P. Massoniana*, Lamb., which is much cultivated in Hong-Kong and likely to thrive at low elevations in India.

P. Massoniana, Lamb.—Is said to have been tried in Simla and Rawalpindi in 1918-19 and is reported to have given no success. I do not know the source of the seed but if obtained from a seed-dealer it was probably not *P. Massoniana*.

P. insularis, Endl., better known as *P. Khasya*, Royle.—We have had no success with this species, the young plants damping off. A few seedlings survived for a year and were planted out in the hope they would do better in the ground but they too failed.

P. ponderosa, Dongl.—Sown in May 1921 in Dehra Dun and germinated during the rains but did not look happy in November. By the following June none remained. Var. *Jeffreyi* was also tried but the seedlings damped off almost as fast as they came up and none remained by the end of August.

P. occidentalis, Swartz.—This species was introduced in 1912 under the name *P. cubensis* and is believed to have come from Cuba. It is growing very well in Dehra Dun where there are several specimens. The trees are now 18—20 ft. high and have not yet flowered but appear to be *P. occidentalis* rather than *P. caribæa*.

P. palustris, Mill.—Is I believe being tried in the Punjab.

P. caribæa, Morlet.—This species is under trial in the Punjab.

P. tæda, Linn —We have seedlings of this species doing fairly well. They have passed through a monsoon without excessive losses.

P. echinata, Mill., better known as *P. mitis*., Mchx —Sown in Dehra Dun in spring 1922 but most of the plants damped off in the rains. The survivors steadily decreased in numbers and the last few were planted out but failed to survive the following monsoon. Sown again in May 1923 but all damped off during the rains.

P. halepensis, Mill.—I have tried this species in the hills but did not see the results. It is unlikely to do well except perhaps in Baluchistan.

P. Pinaster, Aiton.—This species is occasionally seen in hill stations and does well when young but as it does not stand snow well it should not be grown at high elevations. The biggest

specimen I have seen is near Almora and it does not look to be thriving.

P. patula, Cham. and Schl.—Sown in Dehra Dun in spring 1922 but all the seedlings damped off as soon as the monsoon started.

P. attennata, Lemmon, better known as *P. tuberculata*.—Tried in Dehra Dun with exactly the same results as with *P. echinata*.

P. Sabiniana, Dougl.—Sown in Dehra Dun in July 1923 but all the seedlings damped off. Sown again in September and gave a few vigorous seedlings which survived the monsoon of 1924 and are looking well.

Pines in India as far as experience goes are very particular as to their climatic requirements. *P. longifolia* although it is found naturally at low elevations and grows well enough in Dehra Dun is not at all happy in Calcutta. In Lahore it is difficult to grow from seed and there are heavy losses of young seedlings. In Dehra Dun the best results with pines have been obtained by sowing the seed as soon as the monsoon is over and putting the seedlings as soon as big enough to handle into separate pots filled with sand. If this is not done seedlings are apt to damp off in large numbers. The excessive losses of seedlings of *Pinus insularis* and *Merkusii* from damping off which caused the almost total loss of large batches of seedlings was not anticipated as these trees are accustomed to a heavy rainfall. Experiments are in progress to elucidate the cause of the "damping off." In the United States, according to Carl Hartley and Roy Pierce, Department of Agriculture Bulletin, 453, damping off is usually due to one of several species of fungus. In some cases similar results to damping off have been shown to be due to strong sun injuring the tender seedlings. Neither of these causes will account for the trouble in Dehra Dun. Fungi were suspected but have not been observed on seedlings which have damped off. Treatment of the soil with sulphuric acid which is effective in controlling damping off in America has had no beneficial results in Dehra Dun. That the trouble is not due to sun-burn is fairly certain as it is worst in the rains and worse in partly shaded beds than in those freely exposed.

At present all that can be said is that in Dehra Dun only two species of pine thrive, *viz.*, *P. longifolia* and *P. occidentalis*, the identification of the latter requiring checking as soon as the trees produce cones. Judging by their climatic requirements it should be possible also to grow *P. leiophylla*, Cham. and Schl. *P. tropicalis*, Morelet, *P. Massoniana*, Lamb., *P. Merkusii*, De Vriese, *P. insularis*, Endl., *P. pseudostrobus*, Lindl., *P. Montezumæ*, Lamb., *P. Lawsonii*, Roezl., *P. palustris*, Mill., *P. caribæa*, Morelet, *P. tæda*, Linn., *P. glabra*, Walt., *P. oocarpa*, Schiede, *P. clausa*, Vasey and *P. serotina*, Mchx. In cases of variable species such as *P. Montezumæ* there would be little prospect of success unless the low-level form were tried. Pines are grown from seed which keeps fairly well or by bud-grafting of scarce species on to stocks of the common kinds. I have failed with bud-grafting and I do not think this method of propagation is likely to be easy in India.

PICEA.—Thirty-eight species have been described but the number is likely to be considerably reduced. As far as is known only the two Indian species *P. Smithiana* and *P. spinulosa*, Beissn. are cultivated in hill-stations, the former in the West Himalaya and both in Darjeeling. *P. Smithiana*, Boiss., used to be represented in Dehra Dun by a small specimen which had been growing for many years, until it was cut down and destroyed. It was about 4 ft high and made annual growths of only 1—2 inches. None of the spruces are likely to do well at low elevations.

GINKGO.—A single species *G. biloba*, Kaemp. This remarkable tree can be grown in the plains and there is one small specimen in Lahore which has made little growth during the last 12 years. We have one in Dehra Dun now 12 years old but though quite healthy it is only 3 ft. high. There are some good specimens in Dehra which are planted in a very sheltered place on the edge of an irrigation channel. There are a number of specimens in Simla and one very good one in Mussoorie. To do well in the hills it requires a moist situation and still more so in the plains. It is best to grow it surrounded by other trees without however overhead shade. It is of no use for planting at low

elevations except as a curiosity and in Lahore where a considerable number have been planted it cannot be expected to grow more than about 6 inches a year even under the most favourable conditions. Ginkgo is readily grown from imported seeds.

CEPHALOTAXUS.—Pilger in Das Pflanzenreich recognizes six species. I do not think any have been tried at low elevations in India but we have specimens of *C. Griffithii*, Hook., f., from Chakrata. I do not know if this species is still living at Chakrata or if both sexes were cultivated, the specimens show male flowers. The species is in cultivation at Maymyo, Burma.

R. N. PARKER, I.F.S.

THE INTRODUCTION OF MAHSEER INTO THE HARCOURT BUTLER LAKE AT MAYMYO.

The Harcourt Butler Lake in Maymyo is an artificial lake completed in 1920 by the construction of a bund across a rather wide and swampy valley. The lake is fed entirely by springs and covers an area of a little over 100 acres. It was decided to experiment in stocking this lake with mahseer. At the head of the lake there is a small spring-fed pond which was considered suitable for the experiment and attempts were made to introduce a small number of mahseer into this pond in April 1924. Although mahseer are known to occur in the streams not very far from Maymyo, it was considered better to procure the fish from some of the smaller streams in the Bhamo district and Mr. H. Beresford Barrett, I.F.S., was deputed to collect the fish and bring them up to Maymyo.

Bhamo is situated a day's journey by launch above Katha the nearest railhead, and three days by a launch above Mandalay. The streams from which the mahseer were collected are between 15 and 17 miles from Bhamo. It was intended at first to place the small mahseer in teak barrels for transport, but on arrival at Bhamo it was found that the teak barrels were still exuding oil and they had to be abandoned and replaced by large earthenware jars known locally as Pegu jars. The fish were caught

by netting in the pools after the flow of water had been deflected above the pool by a small dam. After catching, the fish were kept in bamboo baskets placed in the stream and were moved downstream in these baskets. In all some 90 fish were caught and were placed in the jars and removed by cart at night to Bhamo. This was carried out satisfactorily. The following morning the jars were transhipped to the launch which immediately started down the river. The launch journey was disastrous. It was very hot and there was little breeze. Attempts were made to keep the water constantly aerated with syringes but were not very successful. The river water at the time was effected by a snow rise and was very "dead" and when this water was used to replenish the jars, it had a very adverse effect on the fish. Only 38 fish were alive on arrival in Katha. Although it had originally been intended to transport the fish by launch right down to Mandalay it was then determined to tranship them by train so as to take them as rapidly as possible to Maymyo. The mahseer survived the train journey excellently in spite of waits at the ferry and Mandalay station in the heat of the day and 36 fish were successfully introduced into the pond at the head of the lake in the evening following the departure from Katha. It would appear that the principal reason for the mortality on the launch and on the contrary, for the success which attended the transhipping by cart and train was the constant shaking of the water in the jars which aerated the water sufficiently to keep the fish alive. To add to this a bamboo net work was introduced in the neck of the jar and this also assisted in the aeration by breaking the surface of the water when it was jolted about by the shaking of the cart or train. As far as can be ascertained up to the end of September there have been no casualties among the fish and although the pond into which they were put is very weedy and it is impossible to see all the fish at a time a considerable number of them have been observed swimming about and Mr. Barrett considers that they have increased at least 50 per cent. in size. Now that the first experiment is a success it is intended to introduce a considerable number of mahseer into the lake direct and attempts will also be made with a limited number of fish to observe them

in a small observation pond. It has now been ascertained that mahseer can be obtained quite close to the railway station at the foot of the ghat leading up to Maymyo and transport would entail only about three hours railway journey so that the prospect of a considerable percentage of survival can be confidently anticipated. Very little appears to be known of the spawning of mahseer and any information readers may be able to send to the *Indian Forester* would be very welcome.

THE DEVELOPMENT OF SAL SEEDLINGS IN GORAKHPUR TAUNGYA.

In the following lines I wish to record some interesting observations on the development of *sal* seedings based on close investigations into the growth of *sal* under the *taungya* system in Gorakhpur Division, U.P.

It has been maintained that as a rule *sal* seedlings stop growing somewhere in October and that they begin again late in March or in the beginning of April.

The West Lehra *sal taungya* in this Division seems to be an exception to the rule.

Before going into the details as to how it does keep growing during practically the whole of the cold weather it is necessary first to lay down the fundamental rules under which such results have been obtained. They are in a nut-shell, (1) good nala-bank type loamy soil, with a fair proportion of sand, dug and aerated to a depth of 18″; (2) sown with fully *matured seed* (I hope to describe in a separate article what I mean by mature seed); (3) kept weeded and clean during the rains; (4) given full overhead light during the whole of cold weather; (5) and more or less immune from frost-bite.

The seed is sown as usual at the beginning of the monsoon. If the seed is fully matured and sown in cool and wet soil the radicle descends into ground with marvellous rapidity reaching within a week, to a depth of 10″ to 12″ while the hypocotyl remains in a more or less dormant state looking just like a red needle. The thick fleshy cotyledons expended all their stores

towards the development of the tap-root alone. When it has reached the desired depth and is capable of drawing its own nourishment from the ground, up goes the stem, clean 5" to 7' to the first inter-node. *And this is my ideal seedling.* The long, clean stem below the first pair of leaves always denotes a correspondingly long tap-root except when mechanical obstruction comes in the way of root-development caused by hard, unbroken, and stiff clay ; then the reserve food-store in the fleshy cotyledons wrongly goes to develop the stem instead of the root first, and such a seedling is always short lived on account of the bushy and shallow roots.

To return to the subject, when the first pair of leaves has spread out, it is now again the turn of the root to proceed still deeper, until after 10 or 15 days the leaves again multiply, and in about a month or so perhaps double, treble, or fourfold themselves. Now after this, when it is about the middle of August there are no more additions to the leaves until the end of the monsoon and the whole of September and more than half of October is spent in root development alone.

Now this phenomenon of the apparent cessation in the outward growth in the later half of the monsoon is the second deviation from the old rule. I think the seedling keeps growing upwards in the later half of the monsoon, only in soils, which are not ideally *prepared and suited* for *sal* whereas, in favourable soils, it employs all its energies in pushing down its root alone deeper and deeper when the soil is yet soft and moist and the upward growth remains at a standstill until a sufficiently deep tap-root is ensured.

A proof is obtained in the examples of West Lehra (Sandy loam nala-type) and Campierganj (hard clay *sal taungyas*). Both are treated under the same prescriptions. West Lehra *taungya* ceases to grow in the later half of the monsoon. Campierganj *taungya* keeps growing the whole rains. But the moment the monsoon is over, West Lehra *taungya* starts spasmodic growth at intervals of every 20 or 30 days till May, while Campierganj *sal* stops adding any further height growth or leaves. The roots of seedlings dug up during October in both places showed a

Fig. 1.

A *sal* seedling with healthy root from West Lehra *taungya* four months old (3′ 1″). Note the length and regular tapering root, suggesting a regular and uninterrupted activity in its development. (From a photo by the author.)

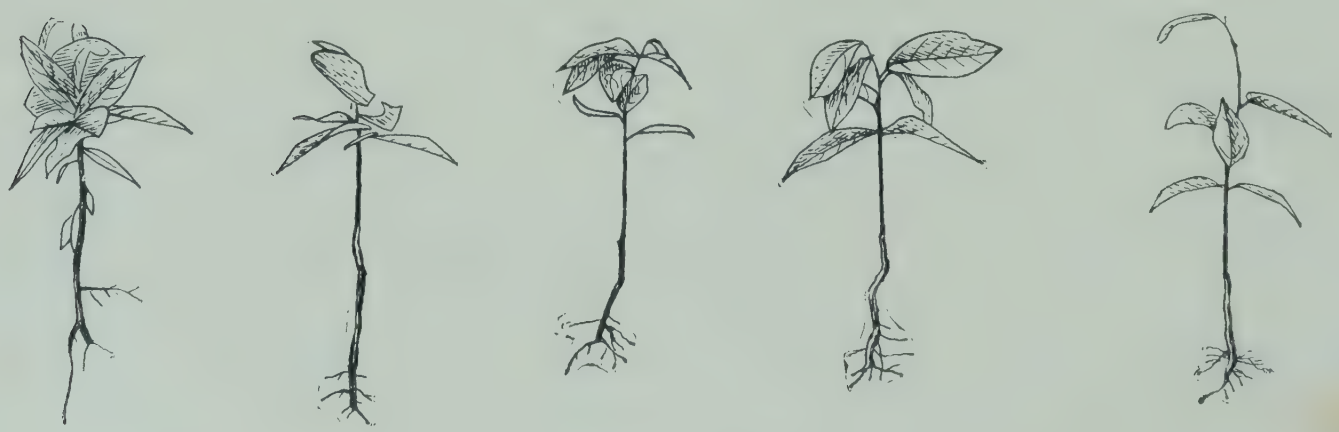


Fig. 2.

Shows five average *sal* seedlings of Campierganj *taungya* of the same age as in fig. 1. Note how the root developed vigorously in the beginning but the subsequent hardening of the soil brought about an abrupt ending. (From a photo by the author.)

remarkable difference. While the one (fig. 1) grew by leaps and bounds in West Lehra, the average being nearly 2′ 3″, in Campierganj the growth was very very poor (fig. 2) and the average was less than half that of West Lehra.

The reason is not far to seek. I firmly believe that the *sal* seedling roots results mechanical obstruction and are not as sturdy as those of *asna*, its close neighbour on such soils, which latter goes on breaking the sub-soil no matter how hard it is. Although, the Campierganj soil is also worked to a depth of 18″ still the stiff and clayey nature of the soil makes it sufficiently sticky and compact after the first two months' rainfall to resist to a certain extent the downward growth of the *sal* seedling tap-root. The result is again the same as was in the case of seed-germination. The stem development during the rains exceeds the food supplying power of the shallow roots with the result that while West Lehra seedlings begin to grow vigorously on the approach of the cold weather their Campierganj brothers are dying back for want of moisture. West Lehra *taungya* goes on putting on new growth during every month from October to May with perhaps temporary cessation in January when sometimes there is very light frost. In the next season again, as soon as the monsoon begins, all outward growth stops, and the healthy plant takes to root development during the rain. But in Campierganj a good many of those seedlings, that had died back during the preceding cold and hot weather shoot up again suggesting thereby, that while the stem had temporarily died back the root was still persisting. Only it (the root) was temporarily unable to support the aerial portion of the plant for want of sufficient moisture.

Apart from the soil there is another important factor which retards the outward development of *sal* seedlings and that is *shade*. Last year in West Lehra *taungya* the *sal* growing with Rabi (cold weather) crop kept putting on new growth the whole of the winter season, but under *arhar*, which kept the *sal* very much shaded, whatever escaped the pig's teeth did not grow a single inch during winter and as soon as it was opened out in April each and everyone of them died back.

The conclusion, therefore, is that given favourable conditions *sal* does keep growing the year round. When the seedling has well established itself during the first half of the monsoon and has ensured its proper supply of atmospheric gases by spreading out 4 to 8 leaves, it spends the rest of the monsoon days in its root development exclusively, both in length and thickness, which subsequently enables it to shoot upwards in the cold weather. Thenceforward root and shoot development go hand in hand, one after the other alternately every month till May.

M. SHAUKAT HUSAIN,
Forest Ranger, Gorakhpur.

HEIGHT GROWTH OF SEEDLINGS.

The measurements of the periodical height growth of seedlings were published in the December number of 1922 and in the January number of 1924 of the *Indian Forester*. Measurements on *Shorea robusta* have been continued for a further year and new measurements are given for *Adina cordifolia*, *Sapindus emarginatus*, *Ougeinia dalbergioides*, *Acacia arabica*, *Eugenia Jambolana*, *Buchanania latifolia*, and *Spondias mangifera*.

There is little to add to last year's comments. A further set of *Bombax malabaricum* again died down completely in the hot weather and again sprang up vigorously when this year's abnormally late rains appeared.

In the *Indian Forester* of February 1924 an article appeared on the "Evolution of a *Sal* Seedling" in which the theory was advanced that the development from the start consisted in a series of rushes of comparatively short duration with intervals during which the development above ground slowed down and the *sal* stored up energy for the next rush. A further theory has gained ground and seemed indicated last year that the young *sal* increases in height during April, May and June then slows down or stops during July and August and makes a further spurt at the end of September or in October. My measurements do not quite confirm these theories. I think we are

partly misled by the appearance of young bright red leaves in September and October. The history of my measurements on *sal* is that in 1922 the young *sal* began to increase in height in April, quickened in May, attained a maximum in June and then slowed gradually and regularly till October, when it ceased growth. In 1923 growth was greater. It began in the middle of March and from the middle of May to the middle of July showed maximum height increment, it then tailed off greatly but continued to grow till early in October. In 1924 height growth commenced early in March and was rapid but again reached a maximum from the middle of June to early in July but continued rapid growth till the middle of September with a slight decrease in August. It then tailed off and ceased at the end of October.

There appear to be two main types of species in this region—

(1) Those which commence in March or thereabouts and grow steadily on to the end of the rains, *e.g. Shorea robusta, Dalbergia Sissoo.*

(2) Those which commence at or just before the rains and grow on to the end of the rains, *e.g. Acacia Catechu, Terminalia tomentosa.*

In each class there are variations as to when maximum growth occurs. Thus in 1924 *Eugenia Jambolana* actually stirred to life in January well before other species and *Ougeinia dalbergioides* continued growing in 1923 till early in November about a month after everything else had ceased. Other species have a very short height growing season indeed. *Acacia Catechu* for instance hardly begins till June and is practically finished by the end of August.

Except as above modified there is nothing to add to what was written last year. These experiments will now be discontinued. The table shows the growth each season from the commencement. (See also Plate 4).

The total average heights in inches attained were :—

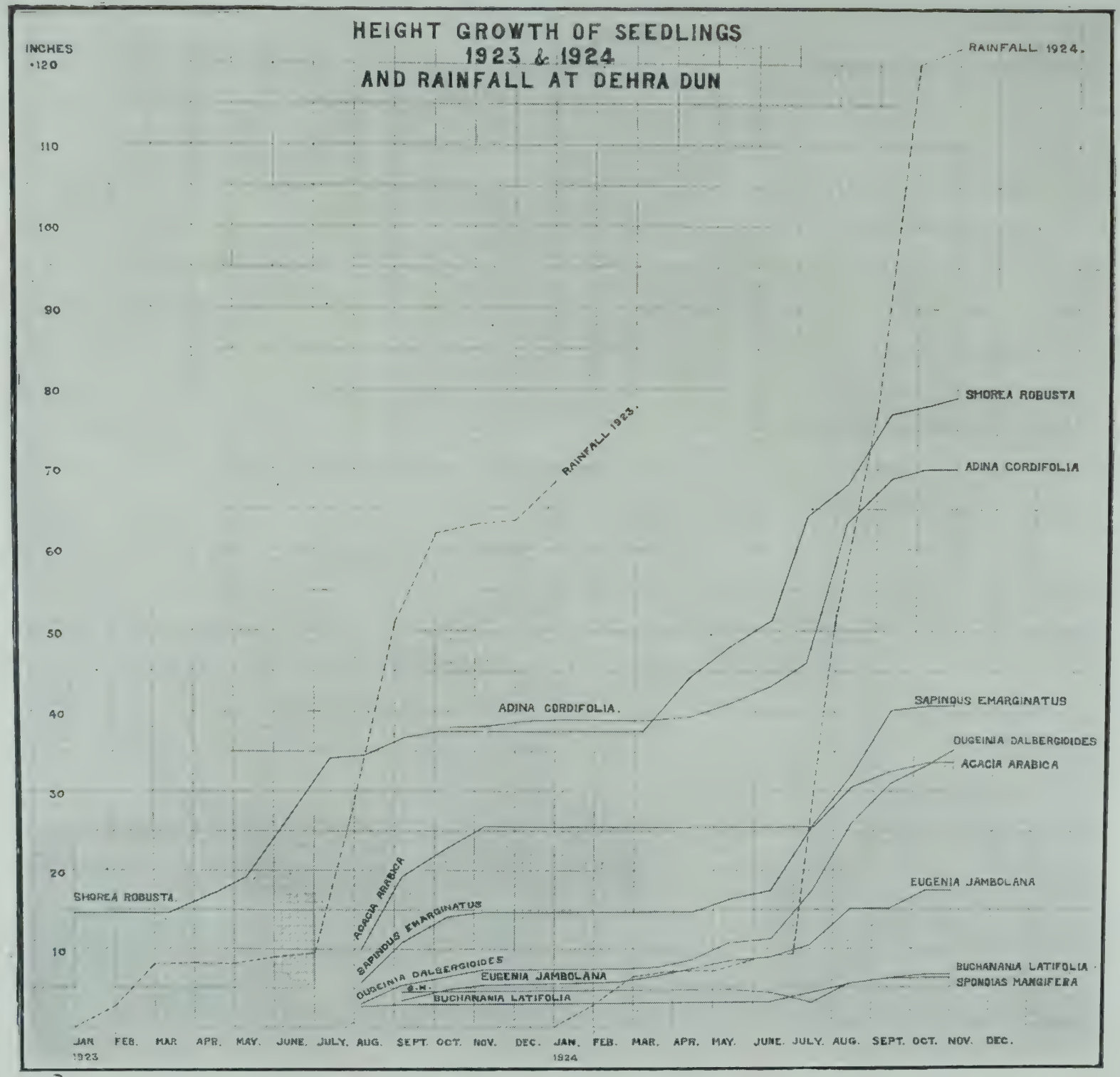
Species.	One growing season.	Two growing seasons.	Three growing seasons.	Four growing seasons.
Shorea robusta ...	4½	14½	37½	79
Terminalia tomentosa ...	12	51	78	Not continued.
Dalbergia Sissoo ...	12	45½	72½	Ditto
Acacia Catechu... ..	30	79	117½	Ditto
Adina cordifolia ...	Not recorded.	Not recorded.	39	70
Ougeinia dalbergioides ...	7½	35½	...	...
Sapindus emarginatus ...	15	41	...	...
Acacia arabica ...	25½	33½	...	...
Buchanania latifolia ...	3	6½	...	...
Eugenia Jambolana ...	5½	17½	...	...
Spondias mangifera ...	4½	6	...	...

S. HOWARD, I.F.S.

MANIPULATION OF TIMBER DRYERS UNDER INDIAN CONDITIONS OF CLIMATE AND LABOUR.

Of the three factors that constitute the process of Artificial Seasoning of Timber—Ventilation, Temperature and Humidity—the first only remains constant from beginning to end of the process, and the other two must be varied in accordance with a predetermined course which has been found out experimentally in the first instance, by the Forest Research Institute, and which is communicated to the person wishing to dry timber, in the form of a guide chart or schedule.

The temperature has to be increased gradually, starting a little above atmospheric and rising gradually up to a maximum heat, which is timed to coincide with the fibre-saturation point


HEIGHT GROWTH OF SEEDLINGS
1923 & 1924
AND RAINFALL AT DEHRA DUN
INCHES
120
110
100
90
80
70
60
50
40
30
20
10
RAINFALL 1924.
SHOREA ROBUSTA
ADINA CORDIFOLIA
RAINFALL 1923.
SAPINDUS EMARGINATUS
DUGEINIA DALBERGIOIDES
ACACIA ARABICA
EUGENIA JAMBOLANA
BUCHANANIA LATIFOLIA
SPONDIAS MANGIFERA
ADINA CORDIFOLIA.
SHOREA ROBUSTA.
ACACIA ARABICA
SAPINDUS EMARGINATUS
DUGEINIA DALBERGIOIDES
EUGENIA JAMBOLANA
B.N.
BUCHANANIA LATIFOLIA
JAN FEB. MAR APR. MAY. JUNE. JULY. AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY. JUNE. JULY. AUG. SEPT. OCT. NOV. DEC.
1923
1924

or stage where the free water has been extracted, and only the moisture in the fibres remains. This maximum temperature is maintained then until the seasoning is complete.

The Humidity is decreased from an initial stage of high humidity produced artificially by steam vapour, through phases of medium moisture to a final dryness of the circulating air that will complete the seasoning.

These changes are produced by the manipulation of certain valves and dampers and the curves of increase and decrease are integrated into either small or large steps up and down.

The question of how these valves, etc., are to be operated must be considered commercially as well as technically, and taking into consideration the conditions of labour that prevail.

It is quite possible to use Thermostats and Humidostats to operate the valves. These instruments will when set to a certain temperature or humidity, maintain constant conditions in spite of boiler pressure fluctuations or atmospheric changes. A Thermostat is fairly simple as a difference of two degrees will give expansion or contraction on the receiving end, with sufficient force available to close or open a balanced steam valve. A Humidostat is somewhat more complicated as a slight change in humidity will only give minute forces, and therefore a relay apparatus introducing hydraulic power or other servo-motor is required, directed by the minute strength of the moisture sensitive "brain" of the apparatus.

Granted all this a Thermostat or Humidostat can only maintain constant conditions. Increase in temperature or decrease in humidity can only be obtained by altering the setting of the directing end of the instrument. If altered at long intervals the steps are somewhat abrupt, if at short intervals it means constant attention.

Alternative to Thermostats and Humidostats is hand-operation and constant attention throughout the 24 hours, necessitating three operators working in shifts.

To decide which to adopt we must take into account labour conditions and costs.

(Automatic Instruments are costly and liable to error, but let us assume that they are gratis and infallible.)

In both cases Recording Hygrometers are necessary to indicate the course and record that this has been followed.

Hand-operation of the valves controlling temperature and humidity is a simple matter as a course is indicated on the recorder and if the pens deviate from this course a slight movement of the valve brings it in line again. True this has to be done at frequent intervals and the evolving effect of night, the heating effect of day sun, and humidity of rain has to be corrected but it all can be done by men of ordinary intelligence.

Automatic instruments need less attention but more expert handling and more expensive men.

In India there is a plentiful supply of men at about Rs. 50 per month, who are quite capable of working the hand-operation, but not equal to the management of the complicated instruments, You can get three men for hand-operation for the price of one who would be equal to the Automatics, and whereas the three cover the 24 hours in three shifts, the one only is present for one-third of the time, leaving the timber at the mercy of the instruments for 16 hours in the 24 and involving big steps in change of conditions.

In countries where the cheapest labour is three or four times as costly as in India there is a case for automatic control apparatus but in India all is in favour of hand-control and constant attention by relatively low priced men, particularly if all humidity calculations are eliminated by using the guide chart course-indicator.

Actual practice shows that Indians of sufficient education are glad to secure these positions at Rs. 40 to Rs. 50 and that after 3 or 4 weeks learning they do excellent work both in operating the dryer controls and also weighing samples and the other routine.

In America, Drying Kilns for timber are generally run to a day by day schedule of Temperature and Relative Humidity. As direct reading percentage Hygrometers are quite unreliable

this means working out the wet bulb equivalent for this humidity at the stated temperature (from table or curve). Heaven knows why they take this extra trouble when the schedule could just as easily be given in terms of dry bulb and wet bulb without mention of per cent. Humidity, which is only interesting in the experimental station where the schedule is produced.

In Europe, Sturtevants introduced the Guide Chart which as it is used on a Wet and Dry Bulb Recording Hygrometer gives the course in terms of the Wet and Dry Bulbs.

The Guide Chart goes on better than the schedule for whereas the schedule is day by day, the Guide Chart having continuous lines is practically minute by minute, showing at any given moment what ought to be the conditions inside the dryer. The position of the points of the pens shows in what degree this predetermined course is being followed, and the ink in the pens leaves record of this.

American Timber Dryer Makers favour a Recording Hygrometer with a circular chart completing 7 days. This is quite enough when working to schedule—it records and that is all that it is asked to do.

Sturtevants use a Recorder in which a strip chart is wound off a spool (like that on a film camera) on to a drum. This drum makes one turn in 7 days and so keeps the chart moving at uniform speed relative to the pens, but charts from 7 days up to 40 or 50 days continuous strip can be used. This covers the time for seasoning most timbers so that only in exceptional cases is the record divided whereas with the circular dial the process is divided up into 7 days circles which cannot be observed together.

As to actual practice with Indian operators, it is found that with the continuous lines to follow, and the immediate betrayal by the ink in the pens, of any deviation, their attention is kept on the work and they produce wonderfully good records, and correspondingly good results with the timber under treatment.

When following a speciality through various countries one has to study the people who are to do the work and their economic conditions.

The best and most wonderful machine or systen from one country may not fit in with the people's little ways in another or with the climate, and the arrangement must be altered and adapted. In a cheap labour country labour saving devices are sometimes undesirable as whilst keeping fewer people at work they put more work and responsibility on the management.

With Timber Dryers for India, the simplest system is the best, instruments giving direct observation without calculation and division of work into simple operations.

The Forest Research Institute at Dehra Dun has been picking the brains of the world – Europe and America—on the subject of timber seasoning, apparatus and operation, and having the best varieties known of experimental apparatus to start with is adapting this to Indian conditions and experimenting with most satisfactory results on Indian timbers and with mainly Indian staff (1 European specialist and 9 Indian Assistants and operators) and the results obtained are presented gratis not only to Government departments but to all who want help with seasoning problems for the development of Indian timbers in the most economic manner possible.

STANLEY FITZGERALD.

THE MANUFACTURE OF STRYCHNINE AND BRUCINE

It is a fact well known that India is rich in raw materials and it is regrettable to notice that the raw materials are exported in large quantities to foreign countries. Prospectors have explored the country during the past hundred years; valuable discoveries have been made; enthusiastic schemes have been planned; but capitalists do not come forward and start up industries which, if developed, would really prove assets to the country. The lack of commercial enterprise and the fear of facing early trade competition have been the chief impediments in the starting of industries.

In the list of exported goods is a number of medicinal raw materials from which valuable tinctures and refined drugs could

be made in india. There are at present in India but a few pharmaceutical chemicals manufacturing firms and hence the raw materials are mainly exported to Europe for the manufacture of drugs and a portion of the manufactured drugs are again sold back to us. The important alkaloids strychnine and brucine afford an illustration of these conditions.

Although the tropical regions abound in *Strychnos Nux-Vomica*,—the tree from which nux vomica in its commercial form is obtained,—India, in which this tree has a luxuriant growth supplies the world's demand of this drug, two-thirds being furnished by the Madras Presidency. The Travancore and Cochin Hills on the Malabar coast, and the Ganjam, Godavari and Nellore districts in the Coromandal coast are the important places where this drug is gathered and prepared. Very little attention is bestowed upon the cultivation of this useful tree. They grow wild of their own accord and are generally of medium size though occasional specimens reach 100 feet in height. At the end of cold season, the trees are seen clothed in tufts of dull green and white flowers, which present a charming and beautiful appearance. The fruits develop and mature during the winter and form beautiful brownish-yellow berries. These are as big as a small orange and contain a gelatinous pulp, in which are embedded from one to five button-shaped seeds.

The right of gathering the fruits is preserved by the forest officers and is sold by a system of licenses put to auction annually in the different districts. As a matter of fact owing to insufficient and careless supervision nearly half the commercial supply comes on the market through more or less illegal channels. On account of this and the fact of its wild growth, it has not been possible to obtain an estimate of the amount of crop available either before or after the season. The domestic market is almost non-existant in an organised sense and therefore the production depends upon the price of the substance in foreign markets. So long as the price is high in the foreign markets a vigorous effort is made in gathering as much crop as possible and in periods of low prices practically no attention is paid to the gathering of the crop and much of it is allowed to rot in the forests.

The actual work of gathering the seeds is done by the forest tribes, Ghonds, Maharas and Santals to whom this work is a secondary occupation. After washing the pulp or allowing it to rot, the seeds are spread on a mat to dry in the sun. They then are sold to licensees, or middlemen, who in turn sell them to large licensees, and eventually to the large exporters at Madras Coconada and Cochin who stock them in large quantities. The seeds are washed and sorted by these exporters. The good seeds which sink to the bottom are picked out from the floaters or underweight ones. They are packed in bags of 164 or 182 pounds and sold as "general average of the crop, Europe cleaning." The under-weight ones fetch usually less than half the prices of the cleaned seeds and in years of low demand may remain unsold. The market received its stock of the seeds usually in December and the gathering season extends through the cold weather to March or April. The most important countries of consignment are Germany, England and America.

The seeds are made soft by the process of steaming and by means of a edge runner they are cut and pounded. They are then extracted with alcohol. The extract is concentrated and lead acetate is added to precipitate tannin. The excess of lead is removed from the filtrate with hydrogen sulphide and the alkaloids are then thrown down from the filtrate with ammonia. Brucine is separated from strychnine by its greater solubility in alcohol. Strychnine crystalizes in colourless prisms and brucine in colourless needles.

Of the two alkaloids, strychnine and brucine, the former is important from the medical point of view. It forms a component of most of the patent tonics sold in the market such as Easton's syrup, laxative pills, phosphates and glycero-phosphates of strychnine and quinine, etc.

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Government Glue Factory, Madras.

UTILISATION NOTES FROM BIHAR AND ORISSA.

Of the many problems in forest development which confront us in Bihar and Orissa that of developing the lac industry is at once about the most important and the one on which principal attention is now being concentrated by the Forest Department. In their manual on Lac and Shellac Messrs. Lindsay and Harlow drew attention to the importance of this industry to Bihar and Orissa which supplies half of the total world crop of lac, and they suggested certain lines of action which the Local Government might take to stimulate the industry, the most important of which was the establishment of brood lac farms in the main lac growing centres. As a start in 1920 the Forest Department acquired an area of 421 acres containing about 28,000 *palas* (*Butea frondosa*) trees at Kundri in Palamau district. Departmental lac cultivation was initiated therein with gradually increasing success. In 1923-24 the Kundri brood lac farm yielded a net surplus of Rs. 10,000 and the total capital invested in the area has now been completely recovered.

The success of the Kundri farm led to further investigations being carried out on the subject of extending lac cultivation. Two, principal lines of action presented themselves. The first was to extend departmental lac cultivation in existing areas of forest under the control of the department. The most suitable areas were selected and departmental cultivation of lac is now being slowly initiated therein. Owing to the fact however that most of our existing forest areas are not suitable for extensive cultivation of lac either through insufficient concentration of good lac hosts, labour scarcity, or other reasons, the scope of lac cultivation therein will always remain strictly limited and it is the second line of action which consists in the establishment of brood lac farms in selected centres which is going to prove of most importance.

In 1923 proposals were submitted to Government to establish numerous plantations of lac hosts to serve the purpose of brood lac farms, and suitable sites were provisionally selected. Apart from their general value as sources of brood lac to the local

inhabitants, it was calculated that at current market prices for cleaned stick lac such plantations would yield a return of about 20 per cent. on all capital invested and that a return of about 5 per cent. would still be yielded if the market price dropped to so low a figure as Rs. 24 per maund. As a result the Local Government has recently sanctioned the establishment of 15 lac plantations of an average area of 100 acres each distributed over the districts of Palamau, Singhbum and the Santal Parganas, the estimated expenditure thereon of about 2½ lakhs of rupees being spread over a period of the next 10 years. In addition they have sanctioned a further enquiry being made into the possibility of establishing such plantations in the two important lac districts of Manbhum and Ranchi in which owing to the fact that they were non-Government forest districts no sites had been originally selected. Further in another district—Sambalpur—action has already been taken, as prescribed in the 1921 Working Plan for that division, in replanting the annual coupes of one felling series comprising two islands in the Mahanadi river with lac growing species with the intention that these two islands should ultimately become brood lac farms.

The species which it is at present proposed to introduce in the brood lac plantations are *Butea frondosa*, *Schleichera trijuga*, *Zizyhus xylopyrus*, *Zizyhhus Jujuba* and *Acacia Catechu*. The planting distance will be 15′ × 15′ and the spacing triangular giving 222 plants per acre. It is estimated that the ultimate spacing will be 30′ × 30′ so that if 4 different species are now planted alternately the plantation can ultimately be made to consist purely of whatever species gives the best results. The plantations will be properly fenced. Soil analysis will be taken and manuring carried out so as to bring the soil of each up to normal. It is anticipated that with adequate manuring the trees of most of the species will be fit for light infection within a period of 5 years from planting.

On the side of lac research the Forest Department will co-operate so far as field work is concerned with the Indian Lac Research Association the foundation stone of whose laboratory was recently laid at Namkum near Ranchi by His Excellency the Governor

of Bihar and Orissa. The proximity of this laboratory to the summer headquarters of the Local Government has had the effect of stimulating official interest in the industry and it is hoped that Government policy will continue to remain on the present progressive lines.

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Provincial Research Officer, Bihar and Orissa.

REVIEWS.

FOREST ADMINISTRATION IN THE UNITED PROVINCES.

ANNUAL PROGRESS REPORT OF FOREST ADMINISTRATION IN THE UNITED PROVINCES, 1923-24.

The extreme pessimism of the first chapter reduced us to such a state of depression that we were hardly able to finish reading the report. We refer here to the report proper not the excellent summary of the past five years which precedes it. It is about the limit to saddle anyone with two old men of the sea; in all the best stories one is more than sufficient. The United Provinces having at last cast off their other old man of the sea—Bareilly—it is their unfortunate duty not to cast off Kumaun.

The whole first chapter seems to hinge on Kumaun or rather on the results of the report of the Kumaun Grievances Committee. As an outsider judging by results, it appears that the work of this Committee has been to record any grievance, real or imaginary, which could be used as an excuse to disforest a piece of land—and by disforest we mean literally disforesting and merely removing it from the control—we had almost written clutches—of the Forest Department. This Annual Report sums up the report of the Grievances Committee by saying it "attempts as far as possible to ensure that, when the inevitable devastation comes, the remedy to these remedies shall be made as difficult to

apply as possible." We read that, among other things, the forests have been divided into—

Class	I	... 1,917	square miles.
„	II	... 1,169	„ „

In class I there will be "no general restrictions on the exercise of rights. These areas are mainly oak!" Well everyone who has ever seen the result of unrestricted rights in a Himalayan oak forest knows what *that* means. The striking feature of the Himalayas is their bareness, not their masses of forest, and we read that these class I forests are "of importance because they help to maintain the water-supply in the main rivers and catchment-areas." We should have preferred the word "regulate" to "maintain," but it seems a remarkable thing that even a committee should wish to disforest such areas. We seem to remember hearing of floods in the United Provinces and of subsequent drought and famine!

We sympathise with the United Provinces Forest Department, and cannot but quote the warning in the report—

"It seems unnecessary to enlarge on the bad effect these disforestations and unlimited rights will have in Kumaon. Very serious damage to some areas recently disforested is already reported. The idea that because the demand for rights on a particular area is so heavy that it cannot be satisfied, that area should be handed over for destruction is most fallacious but this is what is being done. The more thoughtful inhabitants of Kumaun are already displaying some anxiety at the wanton damage that is taking place. It can be said definitely that the forests in class I under remedy 4 will disappear in a few decades, that those disforested under remedy 1 will do so still more rapidly and that the last state of the Kumaun will be worse than the first. No forest conservancy can ever be instituted without definition and restriction of rights of user. This definition and restriction has been carried out hitherto by the Forest Department with the greatest care to avoid unnecessary trouble to the people, but its actions have been consistently misrepresented."

After that we would give much to read an unexpurgated version of the Chief Conservator's real opinion of the Grievances Committee.

Let us turn to Chapter II, Management of State Forests, which is much more cheerful. The United Provinces is now in the enviable position of having only 715 square miles with no working plan, and of this 711 square miles do not require plans, most of the area being in the Kumaun circle and therefore presumably doomed. Of all the other 7,000 square miles (roughly) in the province all except four square miles is under a sanctioned plan or the plan is actually being prepared. During the year 1,043 square miles of area for revised plans was sanctioned, while another 1,648 square miles were under preparation. Expenditure was Rs. 44,849 and as this is only just over one anna per acre of completed plans nobody can call it expensive work.

This is excellent and if we have had to quarrel with the working plans circle in the matter of prescribed yields we must bow down before this and admit that it has certainly "got a move on." Nor does this tell all the truth. We speak from memory but we believe that there is now no division in the province with a plan more than ten years old.

The report grumbles at the activities of the Finance Committee and the Finance Department in cutting out money on roads.

A good deal seems to have been done with tramways, two being now in full working order and two more shortly expected. Two wet slides have been put into Chakrata.

The next section on buildings contains the following note of warning, "the inadequate provision of buildings for housing the subordinate staff is still a constant source of complaint and many of the existing buildings cannot be properly repaired for lack of funds. In the North Kheri division many of the staff still live in grass huts all the year round." This is indeed false economy. Even the slave dealer knew it was uneconomic to use any but the fittest labour, and he either fed them well or

else underfed them so systematically that he killed them off rapidly and then imported new stock. He never underfed them and still employed them unhealthy. It would be a better economic policy to keep this forest labour healthy and efficient; for the success of the regeneration, especially artificial regeneration, must largely depend on these subordinates.

In places the report gives an uneasy feeling that any proposal of increased revenue is grabbed at without very particular enquiries as to its legitimacy or otherwise, while any departmental proposal for the corresponding and necessary increased expenditure is subjected to a quite disproportionate amount of scrutiny.

The rest of the chapter on protection is interesting but may be summed up by saying that protection against all pests—including man—was on the whole successful. The *Hoplocerambyx* is much less of a nuisance in Dehra Dun but has appeared in Lansdowne. The only serious fires were in Kumaun. Light burning in *chir* forests is being undertaken as a measure of fire protection and in *sal* forests as an aid to natural reproduction.

Chapter III on Silviculture is no longer what it was for, as the report says, the detailed report is now written by the Research Branch and forms part of the annual research report for India. The natural regeneration of *sal* from seed is still an unsolved problem, but progress has been made and annual burning with proper felling in those forests with an undergrowth of *Mallotus philippinensis* or *Clerodendron* seems to give promise of success. Attempts are being made to nurse up the *sal* in the frost bitten *chandars* of the Eastern Circle. *Sissoo* is the only species mentioned but we strongly recommend a trial of *chir* sowings. This remarkable tree grows well in many parts of the plains, does not need rains weeding and *sal* flourishes quite well beneath it. It is unfortunately badly damaged by pigs and porcupines. The *taungya* system is extending and the 250 acres in Gorakhpur six months after this report was the best all round *taungya* for its age we have yet seen, not even excluding the excellent areas in Bengal and Burma. Conditions of course are more favourable than in either Bengal or Burma,

There is such land hunger that there seems no difficulty at all about labour and the villagers really do surprising things.

Chapter IV deals with Exploitation. All the area is under working plans (except the small portions previously referred to). Of this 38 per cent. is under some proper silvicultural system, *i.e.*, clear-felling, uniform (shelterwood) or coppice-with-standards and 52 per cent. under what unfortunately often descends in India to no system at all, namely, selection, selection-cum-improvement or protection. The other 10 per cent. is under improvement fellings.

Except for 25 per cent. of the minor produce practically nothing is exploited departmentally. The Sawmill and Turnery, Rosin and Turpentine at Bareilly, have now been taken over by a syndicate of business men, Government becoming merely a shareholder. For the actual terms of this arrangement the report itself must be read.

Thus ends this unfortunate venture of Bareilly so far as the department is directly concerned. To quote from the report "the conclusion to be arrived at after this five years' experiment is that with rules and regulations as they now stand, and the fact of capital outlay being mainly financed from revenue, no new commercial concern can hope to show a surplus for some years." Well, let us leave it at that. Whatever we think let us obey the proprieties, bare our heads, and shed a respectful tear at its funeral. But we often wonder if the opinion of the ordinary D. F. O. was taken before Bareilly was started.

Lump sum contracts for standing trees are the rule, the purchasers doing the felling and exploiting. The demand for *chir* was so poor that many coupes were not disposed of. *Sal* sold well. The departmental agency for the supply of sleepers to the railways helps to steady this maket. It results in known demand and prompt payments, and allows the contractor to work safely with a smaller capital. The table of outturns by species in para. 70 appears to contain discrepancies, which we have been unable to understand.

At least 6 lakhs of rupees worth of produce is given free under the head of rights and privileges and grazing was provided for over a million head of cattle most of which were cows but $2\frac{3}{4}$ lakhs of which were unfortunately sheep and goats.

Chapter V gives the Financial Results. The revenue dropped by some 10 lakhs. Expenditure, however, dropped by 18 lakhs, some 14 lakhs being curtailed in the Utilization Circle alone. The result is a surplus of over 30 lakhs which has only once before been approached in the boom year of 1917-18, and this is excellent. But this surplus has been obtained by economies and not by expanded trade and that is not such a healthy result. Creditable though such a surplus is it is interesting to analyse it a little so that those who talk of curtailment of expenditure, etc., may realise what the facts are. Taking only areas under working plans either sanctioned or under preparation—the Gorakhpur division is only 2·6 per cent. of the total area of the province, *but it provides 26·8 per cent. of the provincial surplus;* or again the 8 best revenue producing divisions are only 36 per cent. of the total area, *but produce 99 per cent. of the total surplus.* Admittedly this sort of analysis does not convey the whole truth but it makes one think.

The revenue under plans is 1·7 rupees per acre, the expenditure 1·0 rupees per acre and the surplus 0·7 rupees per acre. We doubt if any other province could show figures as good and yet every forest officer will smile when he reads them. There is no reason whatever why the soil should not eventually produce a gross revenue of five times this sum. Certainly time as well as expenditure must elapse before it is attained, but nevertheless it never will be attained without expenditure. As the Chief Conservator points out much of this valuable property is quite undeveloped and money must be provided if it is to be developed.

The rest of the report contains little to comment on or that can be incorporated here. The five years' summary with which the report opens is most interesting. The whole report shows very fine results apparently obtained against a good deal of discouragement and difficulty.

THE EVOLUTION OF PLANTS.

EXTINCT PLANTS AND PROBLEMS OF EVOLUTION, BY D. H. SCOTT, D.Sc., F.R.S. Macmillan and Co., Ltd., London, 10*s.* 6*d.* net., 1924.

This book is based on a series of lectures and deals mainly with the more ancient forms of plant life, concerning which Dr. Scott is of course one of our leading authorities. The second of the six chapters, however, gives some account of the history of our recent flora, mainly of the tree forms, as it can be deduced from fossils of Tertiary and Cretaceous age, and it is eminently readable in connection with Berry's "Tree Ancestors." Short paragraphs summarise available data for most of the leading types including not a few not described in Prof. Berry's work, such as *Eucalyptus*, a figure being given of a well preserved Cretaceous fossil form from Bohemia. From the same horizon in Greenland come fossil *Artocarpus* also figured, and *Viburnum* as a representative Sympetalous form. An account is given of still older Angiosperms known only from fossilised wood specimens of Lower Greens and age, and reference is made to the interesting fossil fruits from the Middle Jurassic of Yorkshire which are probably also Angiospermous. Modern conifers are hardly treated with the respect due to their ancient lineage being briefly dismissed in a short paragraph (p. 104).*

The first chapter and the concluding paragraphs dealing with the second part of the title are of much interest: the genera upshot is the emphasising of our present ignorance of all vital points concerning both the phylogeny and the forward evolution of living plants.

H.G.C.

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* For a detailed account of coniferous fossils, reference may be made to Vol. IV of Prof. Seward's "Fossil Plants," 1919, which gives an interesting review of the special features of living forms, and a full account of fossil forms. The treatment is however, much too technical to appeal to the general reader.

CORRESPONDENCE.

[NOTICE.—Correspondents who wish their letters to appear in a particular number of the *Indian Forester* should ensure that they reach the Honorary Editor by the 15th of the previous month with a request to that effect.]

COPPICING POWER OF SAL.

SIR,—While inspecting an area in Bainkhala Block, Dehra Dun Division, U.P., in which regeneration fellings were made in 1922-23. I was much struck by the large number of *sal* trees of large dimensions, *i.e.* trees in the vicinity of two feet diameter, which, after the felling, had put out lusty coppice shoots.

I measured one stump of an old hollow *sal* tree which was 2′ 7″ in diameter, including bark which had put out several shoots. One of these coming out from below ground level, was 11·5″ on 26th November 1924.

"Subsidiary Silvicultural operations" including the cutting back of trees upto 12″ diameter were carried out in the cold weather of 1923-24, but this tree was not cut back. It was merely left as if it had been cut by the contractor, with a stump about one foot high. The area was departmentally burnt on March 8th, 1924. These shoots have all appeared since the burning which was moderately fierce.

Trees of this girth certainly do not give such shoots in Oudh. Do they elsewhere or is this vigour due to the burning ?

The position of this stump has been marked and the subsequent development of its shoots will be carefully watched.

W. A. BAILEY, I.F.S.,
Dehra Dun.

STORAGE OF HAY IN BOMBAY.

SIR,—In the article on Hay Collection in Malnad State Forests in the November issue of the *Indian Forester* the author states that the Bombay Forest Department store baled fodder

to the extent of 100—150 tons annually. The correct figure is 6,000 tons annually.

The storage sheds have brick or corrugated iron walls with corrugated iron roofs, and the cost of their construction is about Rs. 25 per ton of storage capacity.

A. G. EDIE, I.F.S.,
Chief Conservator of Forests, Bombay

RECENT EXPERIENCES WITH TIGER.

SIR,—The following two recent experiences with tiger may be of interest to some readers. On both occasions the tiger was put up unexpectedly at a very short range, at which it was almost impossible to miss, but made off on being fired at, without giving tongue.

On the first occasion I happened to be in camp with two experienced officers, who held out little hope on the grounds that if the tiger had been hit he would have given tongue or there would have been signs of blood. We searched in vain for blood and gave up the search.

On the second occasion, in the entire absence of blood, I decided to track the animal with the aid of a very keen orderly and in spite of the difficulty we found the dead tiger some 153 paces from the place where it was last seen; even where it lay there was no blood.

This at least shows that neither "tongue" nor "blood" is an essential indication of a hit.

In both cases the rifle used was a '577/.500 and the second tiger received a following shot in the flank, the bullet rupturing the lungs and the heart.

E. BENSKIN, I.F.S.,
Lansdowne, U. P.

URDU TEXT-BOOKS OF FORESTRY.

SIR,—The views of Mr. Gurdit Singh published on page 538 of the *Indian Forester* for the month of October 1924 on Urdu Text-books of Forest Utilization and Silviculture translated by Moulvi Abu Yusuf Ahmed Mohiuddin Faroke, Assistant Conservator of Forests, Hyderabad, are carefully noted. I agree with him so far that the translations are literal and some of the Arabic and Persian synonyms for technical English words are defective, but the mere use of simple Urdu (which is defective in itself and composed of many languages) in scientific works, as far as my experience goes, does not carry the due weight and proper force of the original technical words. For instance, *Imarathi Lakri* is the word used only for building purposes whereas timber means wood (big or small) used for building purposes and also for the manufacture of furniture, etc.; the word *Chobina* is a proper synonym and expresses the full sense of the term used in English. The use of English terms in Urdu is not at all advisable and renders the language rather defective and awkward. I therefore prefer the following terms *Nizamul Amali-Sahra ; Paidawaremumkinul-husul ; Nakheer ; Khazaf ; Sareem ; Sareem-i-kulli ; Inghiras ; Janadil ; Jamar ; Choubina-makhrootha ; Marayee ;* and *Hurra,* for working plan ; possibility ; nursery ; high forest ; coppicing ; clear felling ; plantation ; huge boulders ; stones of smaller size ; dressed timber ; pastures ; and stony soil, respectively. These terms are of course new and unfamiliar at the beginning but will become attractive and familiar when once they are put in common use by the subordinates. Mr. Ahmed Mohiuddin has no doubt tried his best to make his new translations in Urdu interesting by using Persian and Arabic synonyms ; his next edition will be less defective if he prefers to refer to the old Arabic books available on Forestry. The need for Urdu translation of the important books on Forest Utilization and Silviculture long felt by the Urdu-knowing Indian foresters in general and by the forest subordinates of H. E. H. the Nizam's Dominions in particular, is nearly fulfilled by the laborious works of Mr. Ahmed Mohiuddin whose effort in this direction is however creditable.

It is essential that a close study of the methods of planting, conservation and economic utilization of timber should be made by those who are in close touch with the forests in a language that will bring the science of forestry within their easy reach. Urdu is therefore the prevalent medium into which the translation of such books should be made. The work of translation is not an easy task and entails reference to many old and new books of the language in which it is to be produced. The retention of botanical names of trees in Latin shows that this was meant to keep the real significance of the original language. It is therefore necessary that synonyms for English technical words should be hunted out from old Arabic books of science in order to maintain the force and originality of the language. The Forest Department should always be grateful to Mr. Ahmed Mohiuddin for having placed a good record of knowledge and practice in Forestry within easy reach of those whose official language has been Urdu. In conclusion, I think it is high time now to publish an Urdu translation of the Forest Flora compiled by the late Mr. E. A. Partridge, Conservator of Forests—the book to be always in the hands of Forest Subordinates. I shall most willngly assist Mr. Ahmed Mohiuddin in the work if my services are found of any use to him.

KHADER MOHIUDDIN,
Head Clerk to the Conservator of Forests,
Western Circle, Hyderabad.

THE NORMAL SAL SELECTION FOREST.

SIR,—My answer to your literary correspondent in the January number is contained in the following quotation, which should be known to one who is evidently a student of obscure writing:—

"I do not worship that which ye worship
Neither do ye worship that which I worship.
I shall not worship that which ye worship
Neither will ye worship that which I worship.
To you be your religion, to me my religion."

C. G. TREVOR, I.F.S.

NEW YEAR HONOURS' LIST.

We offer our congratulations to the members of the Forest Department who figure in the recent Honours' List published in the Gazette of India (Extraordinary) of 1st January 1925 :—

COMPANION OF THE INDIAN EMPIRE.

Herbert George Billson, Esq., Chief Conservator of Forests, and Member of the Legislative Council, United Provinces.

KHAN BAHADUR.

Khan Sahib Dhanjishah Nasarwanji Avasia, Extra Assistant Conservator of Forests, Balaghat, Central Provinces.

RAO SAHIB.

Mr. Kadamada Ganapathi Belliappa, Extra Assistant Conservator of Forests, Madras.

DOMESTIC OCCURRENCES.

BIRTH.

DAVIS.—At Aldershot on 7th January 1923, to Joan (née Channer), wife of D. Davis, I.F.S., a son.

VOLUME LI NUMBER

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JUNE 1925.

HUNTING TIGERS WITH NETS.

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Imagine immense alluvial plains with savannah tracts alternating with rice fields and open water bhils divided up into irregular lakes by marshy lands covered with reeds and grasses high enough to hide the largest elephant and you have the ideal home of the tiger. The high grass lands full of deer and cattle grazing in the rice stubble, afford him food and there is ordinarily more cover than he requires until the fire season sets in and the patches of grass get smaller and fewer. The season has begun in which the local villager sets off to net deer, the sambhur being his favourite quarry, but an extra troublesome tiger may also be netted should circumstances prove favourable. Vistas are made by pressing down the grass in a straight line; a tiger crossing such a vista is located by men on watch for him, after he has been quietly driven off his kill. We were fortunate enough to arrive to find that a tiger had been turned back at a net placed on the side of a vista which had been netted over a length of 100 yards or thereabouts; another party having formed a line at another vista which joined up two open areas towards which the tiger would not break.

Tiger netting depends for its success on the well-known attribute of a tiger that he will never come out into the open unless wounded or very hard pressed: Consequently any villager who jabs the intended victim hard with a spear early in the proceedings is heavily fined. The process of drawing the cordon round the tiger is interesting to watch and consists in

gradually demolishing his grass cover by pressing it down with the spears with which all the hunters are armed the grass pressers being protected by spearmen prodding the unpressed grass ahead while another posse of spearmen complete a hollow square walking backwards as the pressing goes forwards the spears pointing in every direction. This goes on until the nets are sufficient to enclose the whole area after which, if there is no demonstration, pressing is done just inside the net and the nets brought in first on one side and then on the other. On this occasion there was some delay in getting the nets and the circle was not complete till 8 P.M. when we went home, the area enclosed having a diameter roughly of about 100 yards. Watch was kept all night but owing to everyone's want of foresight there was hardly enough fuel to last out the night. The tiger had been making violent demonstrations at various points before we left. We turned up next day to find the nets drawn closer to the centre of the circle, the hunters being encouraged by the quietness of the tiger. Look outs stationed high up on stout bamboo ladders round the arena were able to see when and where the grass moved and to give warning to the net men in case the animal made a rush. The cordon being reduced to an area so small that pressing by hand became dangerous, resort was had to a log which was put inside the net and dragged through the grass. This revealed the fact that the tiger had escaped by worming his way under nets at some insufficiently guarded spot during the night and escaped. The modus operandi was interesting to watch and given a somewhat better bandobast the tiger might well have been bagged. There was no recognised leader and it struck the writer as wonderful that under the haphazard way everyone appeared to do as he thought fit, a tiger ever is brought to bag but several tigers are caught and killed by these means every year. It generally takes a week or more to give the tiger his coupe-de-grace and the actual log dragging is usually deferred until the last day by which time the tiger is weak from want of water and half drunk from want of sleep. In one instance a tiger was found actually to be dead from want of water.

This is the only practicable method of killing tigers in the vicinity. It would be very dangerous to beat tigers up to guns in heavy grass without any trees in which beaters could take refuge even if they had time. The grass is so dense that a tiger would most certainly get a beater if he broke back. It is obviously impossible to sit up in a sea of grass, a ladder machan would be visible to the tiger before he got to the kill and a pit would probably contain water. The nets used are of jute grown locally. They are about eight feet high and are strung on ropes running in notches made at the end of stout bamboos driven into the ground. Ropes are also used to brace the net work diagonally in a longitudinal direction and the posts prevented from falling inwards by being anchored to grass tussocks. The nets start by being single but as the cordon gets smaller they are doubled and even trebled. A single net could easily be burst through or thrown over but even a tiger could hardly manage to get through a treble net of stout cords on posts standing close together. The business is looked upon rather in the light of a tamasha and thousands roll up to view the grand finale which we hope to see one day. It was a study in contrasts while all the excitement and noise was going on to see in the far distance the mail train creeping up the valley and hear it rumbling over the bridge spanning the adjacent river.

F. T.

SOME NOTES ON NATURAL WOODS OF *CASUARINA EQUISETIFOLIA* GROWING AT SINGORA, IN SOUTHERN SIAM.

During August and part of September I made a rapid tour round parts of Southern Siam, that is, round the southernmost portions of the Malay Peninsula which lie within Siamese boundaries.

I started my tour by taking ship from Bangkok in a small coasting steamer of the Siam Steam Navigation Company, and proceeding down the eastern coast of the Peninsula to Singora which is the chief town in this part of Siam, situated geographically nearly due South of Bangkok. It is the headquarters of the Viceroy and a number of other local officials,

The town is a fairly small one, situated amidst beautiful tropical surroundings, on the southern shores of a creek, with a picturesque back-ground of hills, covered with dark ever-green forests. This creek, which is about 2 miles long and a quarter of a mile broad joins the Gulf of Siam north and south, and at its southern end it gradually opens out and turns northwards, forming the entrance to a remarkable inland sea called Tale Sap.

This inland sea is of irregular shape, winding about between large headlands and islands, stretching out to a total length of nearly fifty miles. Its eastern shore is separated from the Gulf of Siam by a long. narrow tongue of land, broken by one large headland.

The climate of this tract of country is warm, equable and very moist. Rain falls in most months of the year, but the east coast does not come under the influence of the south-western monsoon, the most rainy months being from the middle of September to the first half of January. The heat is much tempered by the pleasant sea breezes.

On arrival, I was interested to see for the first time natural woods of *Casuarina equisetifolia*, growing plentifully on both sandy shores of the creek and stretching out in narrow strips and belts along the seashore, and I was informed that similar woods grew at various places, all along the eastern coast, south of this place, though I did not myself visit them. The tree is common as a plantation tree in many parts of India proper, but does not occur naturally.

The late Mr. A. M. Burn-Murdoch in his pamphlet "Trees and Timbers of the Malay Peninsula" (Part II) states that the trees grow wild only on the coast of the Peninsula and that on the eastern coast a belt of this species stretches almost uninterruptedly for 100 miles along the shore wherever it is sandy, this belt being from 50 to 200 yards in width. This no doubt, refers to the F.M.S territories and not to the adjoining provinces of Siam, but in both, the conditions must be quite similar. He also advocates the theory that the real home of the tree is in Australia, and that as the seed is very small and light and produced in enormous quantities, it has been gradually carried by sea from Australia to Java, Borneo and other islands, and thence to the east coast of the

Peninsula, as it does not occur inland in the Peninsula, except where introduced. This theory however does not account for its natural occurrence on the west coast of the Peninsula, where it is found, in places where the sea coast is sandy.

Northwards of the town of Singora the seashore terminates in a narrow headland of pure sand over one mile long and about a quarter of a mile broad. The total area might be about 250 acres and it is completely covered with a beautiful wood of *Casuarina* trees, except for the last 200 yards or so, at the extreme northern end. The wood is fairly well stocked, though gaps in the canopy appear here and there, and it exhibits all the characteristics of its type, the ground being covered with a carpet of needles and bare of all vegetation, except that, here and there, a few sand-loving undershrubs appear.

It is evident, on inspection, that the age of the wood decreases steadily as one walks northwards, but as there are no written records nor observations of any sort, it is difficult to give precise information of any value, however I managed to obtain the following facts. About 700 yards from the extreme northern point there is a small fishing village and customs house, and nearby these there is a large square cement-concrete pillar which projects slightly above the surface of the ground. This pillar used to serve as the foundation or footing to a telegraph-mast conveying the line across the creek, but it has been in disuse for many years, now.

A Danish gentleman, residing in Singora for the past 19 years, informs me that 15 years ago he stood on this concrete pillar for 3 days in the course of marine surveying, taking observations ; at that time, there were no trees at all and no village, northwards of this pillar, so that he was able to observe freely in all directions.

It therefore follows that all *Casuarina* trees northwards of this point are likely to be less than 15 years old, so I measured the girths of 23 trees standing in a group immediately north of the concrete pillar and found the average girth at breast-height to be 42·4″. The heights of two trees, standing in the above group, were measured with a large marine sextant, and found to be 134′ and 127′ respectively, which gives an average height of

130·5′. As it is not possible to obtain any more accurate information, I give the above facts and the figures resulting from theory as related to me. The rate of growth, as recorded, is enormous and far exceeds anything that I have seen recorded in the plantations on the sea coasts of India proper. This, however, is only to be expected, as the *Casuarina* in India proper is an exotic, planted far away from its natural habitat, whereas, here, in southern Siam, it is growing naturally under much better conditions.

I see in Professor Troup's "Silviculture of Indian Trees," Volume III, page 907, that the mean girth of *Casuarina* plantations in North Kanara, Bombay Presidency, at 15 years, is 22·6″, and the mean height of dominant stems is 51′, it is also stated elsewhere in the book that, on the few occasions on which the *Casuarina* has successfully coppiced in North Kanara the rates of growth were much higher, coppice poles 13 years old attaining 36″ girth and over 80′ in height.

Proceeding northwards from the small above-mentioned village, the height-growth of the *Casuarina* steadily diminishes and much of the growing-stock consists of a thin wood of younger poles, with an average girth of about 24″, but between these there is an excellent growth of natural regeneration, in small groups, which is rapidly filling up the gaps, and finally, at the northern end, there is a narrow fringe of young seedlings and saplings, standing in small patches and as single plants, gradually encroaching on and spreading over the sands.

It appears, that in these parts the natural regeneration spreads slowly and with some difficulty, as the wind blows the seeds from the older trees, but as soon as the young trees are established their enormous growth soon converts the area into a thin pole-wood, and then, within this shelter-wood the blanks are very quickly filled up by groups of natural seedlings.

At the extreme south-eastern end of the woods, which I have attempted to describe above, there is a most remarkable grove of very old *Casuarina* trees, stretching for a short distance along the main coast-line. I estimated the area covered by these old trees, by pacing, to be about 25 acres. These trees are of great age and size and they have become quite unlike the ordinary type

Photos by K. Havmöller.

Fig. 1. View of part of a *Casuarina* wood near Singora town, extending over about 250 acres.
Fig. 2. View of part of the grove of old *Casuarina* trees, near the Singora Club-house.
Fig. 3. Some of the large old *Casuarina* trees, near Singora Club-house.
Fig. 4. Natural regeneration of *Casuarina* spreading over the sea-shore.

of *Casuarina* tree that one knows in India, being of a weird gnarled and weather-beaten appearance, and having mostly massive forked boles and huge spreading crowns. Most of the boles of the trees are very misshapen and deeply fluted, with several large, protruding buttresses at the base of the tree.

Walking down the centre of the grove, I measured 14 trees, that came into my path as I walked along, and found the average girth at breast-height to be 12′ 1½″; one tree measured 20′ in girth, another tree measured by me in another part of the grove had a girth of over 22′, and girths of 15′—20′ are not uncommon. These girth-measurements give some idea of the size of these fine old trees, moreover, in spite of their spreading stature, the height growth also is great, and the height of one tree, growing near the Singora Gymkhana Club house at the Southern end of the grove, measured with a large marine sextant amounted to 143′. Their age is unknown, but must evidently be great, and to all appearances, over 100 years. Residents in Singora for the past 20 years or so, state that there is absolutely no difference in these trees to when they first arrived in the place.

The sea, unfortunately, at this particular place, is eating into the coast, year by year, and, slowly but surely, these giants are being destroyed, one by one. Unless some protective measures are taken in hand in the future, most of them, in the long run, will be undermined and overthrown. This old grove and the adjoining *Casuarina* woods north of it, are not in charge of the Forest Department, but the local Revenue Administration protects them for aesthetic reasons, from damage by the local population.

The great economic value of *Casuarina* wood as a fuel is well-known in many parts of India, and I see that the late Mr. A. M. Burn-Murdoch states that it is said to be the best firewood in the F. M. S., better even than mangrove fuel. On the coasts of Southern Siam, however, it has little economic value for anything, not even for fuel, for all kinds of fuel, as a rule, are superabundant. I have seen it growing on the sandy beaches of the western coasts and have been told that it is used for fishing-stakes in those parts. On the eastern coast the local people use

a certain amount of the poles for building sheds and shelters and they also do cut it for fuel. They are so indolent in their methods that they don't bother to fell each tree singly and then convert it into fuel billets, but they hack and lop at crowns of the standing trees, more and more heavily, until they eventually kill them, leaving the mutilated "corpses" standing about all over the sea-shores.

D. BOURKE, I.F.S.

SOIL CONDITIONS UNDER *SAL*.

Plant growth is intimately related to the conditions prevailing in the soil. So far as the regeneration of *sal* is concerned, Mr. Hole has observed that the primary factors which control the development and growth of seedlings in a particular soil are the aeration and the moisture-content of the soil. These two factors control the bio-chemical changes going on within the soil, which in their turn affect the growth of plants. Bad aeration of soil results in the accumulation of carbon dioxide and deficiency of oxygen in soil-gases and consequently the roots become unhealthy and the plants sicken. Mr. Hole is further of opinion that seedlings often die in shady *sal* forests because the air supply in the soil is deficient during the rainy season. From the results of his experiments he concludes that in an average *sal* forest loam, under natural conditions of rainfall, percolation and evaporation, an air-space of less than 452 cubic inches per cubic foot of soil, or 26 c.c. per 100 c.c. of soil, is extremely injurious to *sal* seedlings. Deficiency of water in the soil also causes widespread damage to seedlings and, provided other conditions are satisfactory, seedlings will develop normally when the moisture in the soil does not fall below 3 per cent. in sand and 10 per cent. in loam.

It may be mentioned here that the experiments of Prof. Troup and Mr. Hole show that accumulation of dead leaves on the surface of forest soils has a deleterious effect on germination. The cover of dead leaves separates the seeds from the reserve of soil moisture and obstructs the passage of the radicle into the soil.

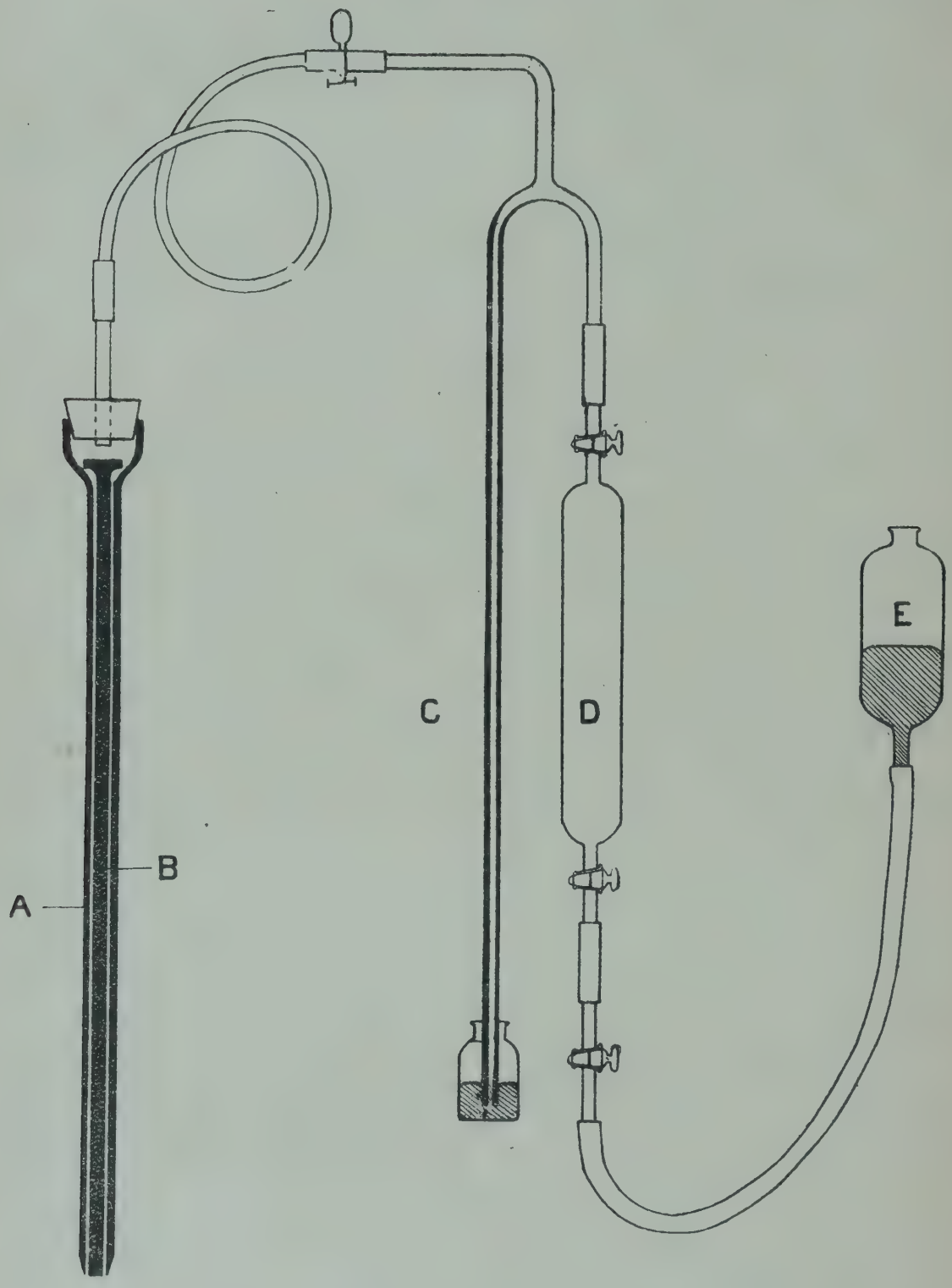
An investigation was undertaken to study the soil conditions associated with the growth of *sal*. Mr. Hole has suggested that the best means of determining the conditions of soil-aeration is the analysis of soil-gases, and for this purpose an easy and practical method of extracting gases direct from forest soils should be devised. (*Indian Forester*, Vol. XLIV, pp. 208.) An apparatus has therefore been employed in these experiments which has satisfactorily answered the purpose. The observations were carried out partly at the experimental garden at Chandbagh, Dehra Dun, and partly at the Lachiwala Forest Range of the Dehra Dun division.

Experiments at Chandbagh, Dehra Dun.

Two small plots under *sal* (15 ft. x 15 ft.) were laid out. The trees are now 14 years old. They were raised from seed and coppiced when about 2 years of age. The tallest stems are now 40 ft. in height. In one of these plots the ground was kept clean and in the other dead leaves were allowed to accumulate.

The soil-gases were extracted by means of an apparatus shown in the diagram on page 244. A wrought iron tube was first driven into the soil up to the required depth. It was then taken out and into the hole thus made another iron tube A of slightly wider outer diameter was pushed in. A loosely fitting iron rod B was next introduced into the tube to reduce the dead space. The tube was then connected to the manometer C and the gas sampling tube D; by lowering the mercury reservoir a vacuum was created in the apparatus and the soil-gases were sucked in. Air originally filling up the apparatus, was rinsed out with soil-gases before final collection was made. The analysis of the gases was carried out in the usual way.

Samples of soils at 3″ to 6″ and subsoils at 15″ to 18″ were also collected and determinations of moisture (loss at 100° C) organic matter (loss on ignition) organic nitrogen (Kjeldahl) and nitrogen in nitrates were made. Mechanical analyses of composite samples of soils were also carried out. The volume of water-free air-space per 100 c.c. of soil was calculated from the weight of a known volume of soil in situ, taking the average density of the mineral constituents of soils as 2·65 and that of the organic matter as 1·2. The results are abbreviated in tables I and III.



It will be noticed that during the rains (July to September) the soils were more or less saturated with water and contained only a small amount of free air-space; the soil of the cleared plot containing a larger amount of air-space than that of the plot with a leaf-cover.

As the rainfall decreased the soils began to lose moisture, the surface soil drying more quickly than the subsoil. As was expected, the plot with a leaf-cover parted with moisture more slowly. With the loss of moisture during the subsequent dry seasons there was an increase in the amount free air-space, but it was only in December that these soils contained such a sufficiency of air-space as was considered by Mr. Hole to be above the safety limit for *sal* seedlings. The composition of the soil-gases also varied with the season. During the rains the soil-air differed from the atmosphere-air in containing a very high percentage of carbon dioxide and a low percentage of oxygen. It was noticed that the gases from the cleared plot contained a much higher percentage of carbon dioxide and a lower percentage of oxygen than those from the plot with a leaf-cover. With the close of the rainy season, the soil-gases approached atmospheric air in composition.

It is also interesting to note that the entire area of the plot with a leaf-cover was found to be thoroughly infested with white ants in December. The incidence of attack by white ants was no doubt an important factor in soil-aeration.

The seasonal variation of nitric nitrogen was interesting. It seemed to be associated with the rainfall in the cleared plot. In the surface soil of this plot nitric nitrogen rose from 0·26 part per million in July to 0·96 part in September and to 1·11 part in December. On the other hand, it followed a reverse course in the plot with a leaf cover. It fell from 3·34 parts in July to 1·31 part in September and to 0·87 part in December. It is not, however, permissible to draw general conclusions without collecting further data.

Experiments at Lachiwala, Dehra Dun Division.

Some experiments were also carried out at Lachiwala and thanks are due to the Divisional Forest Officer, Dehra Dun, who kindly afforded facilities for this work.

Four plots were laid out. Plot No. 1 was under simple coppice of *sal*. Plot No. 2 was selected in the grass area at Zabbarkhet. Plot No. 3 was under *sal* which, last year, was subjected to P.B.I. fellings for conversion to regular high forest

Plot No. 4 was in an area where strip felling had been made several years ago under the direction of Mr. Hole. The strip had subsequently been sown over and tended, resulting in a young crop of *sal* seedlings. Thanks are due to Mr. Kanjilal for help in the selection of the plots.

A plot was also selected from an area which was regularly fired, but owing to the presence of a large amount of stones and boulders in soil, it was exceedingly difficult to collect samples from this plot. One set of observation was however made in September. Results of observations made in these areas have been abbreviated in tables II and III.

As in the case of Chandbagh soils these soils also became more or less saturated with water during the rainy season and contained very little of free air-space. Plot No. 2, situated as it was in the lowlying area at Zabberkhet, remained absolutely waterlogged at a depth of about 8 inches during July and August. With the close of the rains Lachiwala soils, unlike Chandbagh soils, were losing moisture very slowly. Even as late as January these soils retained a considerable amount of moisture. In this respect particular mention may be made of Plot No. 3 (conversion felling) and plot No. 4 (strips). The moisture content of these two plots remained practically constant during the period of observation (July to January). This retention of moisture in these soils resulted in a comparatively slow increase in the amount of free air-space, and Mr. Hole's standard of limit of safety for *sal* seedlings was not attained even in January.

During the rains gases extracted from these soils also contained a very large excess of carbon dioxide and a very small amount of oxygen. As the rainfall ceased there was a recovery in the oxygen content. But in plots No. 1 and No. 4 the subsoils retained a fair amount of carbon dioxide even in January.

From the results of one set of observations made in the fired area it appears that the soil is less retentive of moisture; and even as early as September, the amount of free air-space was above the limit of safety for *sal* seedlings. This soil was better in texture than other Lachiwala soils in so far that it

contained a larger proportion of sand, stones and boulders This difference in the quality of the soil may account for its better aeration, and hence no definite conclusion could be arrived at about the influence of fire on forest soils. Further investigations are necessary to elucidate this point.

Reverting now to the composition of gases within the soil, t may be remarked that the amount of carbon dioxide and oxygen in the soil-air is closely related to the well-being of the roots of trees. Roots of different species vary in their tolerance of carbon dioxide and their response to oxygen, distribution of the root system and of the zones of root absorption during the life of the plant proving to be important factors in this respect (Cf. Howard, "The Effect of Grass on Trees," Proc. Roy. Soc. B., Vol. 97, 1925, pp. 284 et seq.). The results of pot culture experiments of Mr. Hole with *sal* seedlings show that accumulation of carbon dioxide and decrease in oxygen in the percolation water make the roots of the seedlings unhealthy. Reviewing the results of the present investigation, it is noticed, that during the rains, the soil-gases contained an excessive quantity of carbon dioxide and a low amount of oxygen, and the volume of free air-space was also very small. With the decrease in rainfall an improvement was noticed both in the quality of the soil-gases and in the amount of free air-space. In the case of Chandbagh soil it was in December that the amount of air-space was above Mr. Hole's standard of limit of safety for *sal* seedlings. But the Lachiwala soils did not attain this limit even in January. Thus it would appear that the conditions prevailing in these soils, specially during the rains, are not suited for healthy growth of plants, particularly of seedlings. The fact that hardly any recent seedling was noticed in these areas lends support to the above conclusion.

However as the present observations extended only for a short period, and as the rainfall was excessive during the season, it is not permissible to draw any general conclusion. A further detailed investigation is necessary to elucidate the individual effect of various factors involved in the growth of *sal* and their interaction on each other.

The writers take this opportunity of expressing their thanks to Mr. R. S. Hole, C.I.E., at whose suggestion this work was taken up. They also acknowledge the help which has been rendered by Mr. Brahma Shankar, B.Sc., during this work.

JATINDRA NATH SEN
and
TARAK PRASAD GHOSE.

TABLE I.—CHANDBAGH SOILS.

		Cleared Plot.						Plot with a leaf cover.					
		5th August.		17th October.		1st December.		5th August.		17th October.		1st December.	
		3"—6".	15"—18".	3"—6".	15"—18".	3"—6".	15"—18".	3"—6".	15"—18".	3"—6".	15"—18".	3"—6".	15"—18".
Gas	Carbon dioxide %	11·0	12·5	2·6	...	0·2	...	4·2	5·2	1·5	...	No samples taken white ants present.	
	Oxygen %	10·5	8·7	17·6	...	20·0	...	13·1	10·8	19·0	..	...	...
In grams per 100 grams of dry soil.	Moisture %	25·2	28·4	21·8	24·5	11·7	18·3	28·1	29·1	22·7	30·0	13·9	22·9
	Organic matter %	6·0	7·2	4·9	5·9	5·3	6·2	6·8	7·5	5·2	6·6	5·8	7·1
Water-free air-space (in c.c. per 100 c.c. of soil in situ).		14·5	8·0	18·9	10·1	31·4	17·0	9·4	6·1	12·9	10·1	26·8	12·0

N.B.—The blank spaces where no entries are made as to the composition of soil gases indicate that it was difficult to get samples in these instances.

TABLE II.—LACHIWALA SOILS.

	1. Coppice.						2. Grass.					
	25th July.		20th September.		14th January.		25th July.		20th September.		14th January.	
	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″
Gas .. Carbon dioxide %	8·6	...	9·4	...	1·4	3·9	1·7	Water logged.	3·7	0·4	0·5	...
Gas .. Oxygen %	9·4	...	11·0	...	19·2	16·0	9·2	...	16·5	19·8	20·1	...
Calculated on dry soil. Moisture %	36·4	24·7	25·8	26·1	25·1	23·9	33·2	...	34·5	30·5	29·7	25·7
Calculated on dry soil. Organic matter %	8·6	7·2	6·0	6·1	6·1	6·0	7·3	...	4·3	4·4	6·3	6·6
Value of water-free air-space in c.c. per 100 c.c. of soil in situ.	6·6	5·9	10·6	7·6	9·1	20·3	3·2	...	13·6	11·5	14·7	15·0

N.B.—The blank spaces where no entries are made as to the composition of soil-gases indicate that it was difficult to get samples in these instances.

TABLE II.—LACHIWALA SOILS.

		3. Conversion Felling.						4. Strips.						Fired Area.
		25th July.		20th September.		14th January.		25th July.		20th September.		14th January.		September.
		3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″	15″—18″	3″—6″
Gas ...	Carbon dioxide %	11·2	14·4	...	15·8	...	...	...	10·1	...	...	0·5	1·8	4·7
	Oxygen %	6·9	1·3	...	0·8	...	...	...	3·3	...	...	19·6	17·6	15·9
Calculated on dry soil.	Moisture %	24·2	25·8	28·2	26·4	26·5	26·8	24·9	25·2	24·6	24·7	24·0	24·3	20·7
	Organic matter %	6·4	5·6	5·5	5·5	5·5	6·6	5·1	5·3	5·6	7·0	5·1	4·6	5·1
Value of water-free air-space in c.c. per 100 c.c. of soil in situ.		1·7	17·1	3·8	10·5	15·4	13·4	5·2	6·9	11·3	3·5	11·4	17·3	26·9

N.B.—The blank spaces where no entries are made as to the composition of soil-gases indicate that it was difficult to get samples in these instances.

TABLE III.—MECHANICAL ANALYSIS.

	Chandbagh Soils.		Lachiwala Soils.				
	Cleared Plot.	Under leaf cover.	1. Coppice.	2. Grass.	3. Conversion felling.	4. Strips.	5. Fired area
	3″—6″	3″—6″	3″—6″	3″—6″	3″—6″	3″—6″	3″—6″
Clay—24 hours' sediment ...	16·7	19·5	18·1	15·6	17·6	15·9	14·6
Fine Silt, 30 minutes	20·0	22·8	22·7	26·4	20·7	14·5	20·8
Silt - 75 seconds	32·0	28·0	51·3	47·4	50·4	50·1	23·4
Sand	31·3	29·7	7·9	10·6	11·3	19·5	41·2

N.B—The above figures are calculated on a water free basis. The sub soils at 15″—18″ had practically the same composition as the surface soils.

TIGER HUNTING WITH NETS.

THE FROST OF 1925 IN THE *SAL* FORESTS OF THE UNITED PROVINCES.

After some years of mild winters with little or no frost a severe frost, the severest since the great frost of 1905, occurred in the 3rd week of January 1925. This frost did much damage to the "*arhar*" crop at this time in full flower, and as recorded in the newspapers was felt as far as Poona. The effect of this frost on *sal* under various systems of management is of considerable silvicultural interest and teaches several important lessons in forest management which should not be lost sight of in the future.

In the Gorakhpur and Tikri forests, where the system of management is simple coppice and where frost damage is a factor which hitherto has been considered of little importance in forest management, the entire foliage of one or two year old *sal* coppice in Tikri has been killed off. In Ramgarh coupe coppice one year old and 4—8 feet high has with few exceptions been killed to the ground. In coupe IX, 5—10 feet in height, *sal* has been killed to within 2 feet of the ground, and the planted teak up to 3 feet in height have been frost bitten to ground level. In older crops the damage is especially noticeable in low lying places with much grass. Here the *sal* has been killed down to about half its height. Appreciable protection has been given by miscellaneous species mixed with the *sal*. Crops older than 8 years have escaped altogether. It should be noted that where 1st and 2nd cleanings had not yet taken place the frost damage was much less.

The lessons to be learned under this system of management are to delay cleanings in young crops till the winter is over and it is for consideration whether the technique should not be amended by leaving a shelter of miscellaneous species in the main fellings which can always be removed in the subsequent cleanings when no longer required. It is not thought that permanent damage has been done beyond the loss of two seasons' growth but it is quite evident that frost must be considered in these divisions and provided for in the management.

In the forests of Pilibhit and South Kheri under the system of coppice-with-standards no damage has been done except in *chandars* where there are no standards. In the experimental area

clearfelled in the Gola range, frost damage has occurred, although in the original shelterwood experimental area there is no damage. In the South Kheri *chandars* where *sal* had grown up splendidly during the mild winters of the last 4 years very considerable damage has been done, but still there is a net gain in these areas and with the luck of 2 or 3 mild winters much of these areas may be expected to grow up into forest.

Damage has been most severe in the larger open *chandars* in Kishanpur and Hirapur ranges where *sal* shoots which were growing up splendidly in rank grass were damaged to heights of 8 to 14 feet to which size these crops had reached. The smaller saplings have been killed back to ground level and the larger ones will lose about 3 to 6 feet of the tops.

In the *chandars* in Mailani range the damage has been less severe, shoots of about 5 to 6 feet being killed back and larger ones up to 10 to 12 feet escaping with the scorching of their leaves or only portions of the leading shoots. *Sal* shoots on the edges of the *chandars* protected by forest growth alongside have generally not suffered so much as *sal* shoots out in the middle of the *chandars*.

In Hirapur range frost got into some of the low-lying compartments along the Ul Naddi where the forest was open but the damage was not serious here.

Under the shelterwood system of Dehra Dun and Ramnagar damage has only occurred where the canopy either was absent or far too light.

In conclusion it is quite evident that a shelterwood is absolutely necessary over by far the greater portion of the province, that even in Gorakhpur frost must be recognised as a danger that occurs periodically and that must not be neglected and that miscellaneous species can be used to protect young *sal* from frost. The damage done in the subsequent removal of this overwood can be controlled by lopping and if necessary careful departmental felling and this matter is already being taken up in one division. I have to thank the Divisional Officers who have kindly supplied me with the information contained in this note.

C. G. TREVOR, I.F.S.

PRIZE DAY AT THE FOREST COLLEGE, DEHRA DUN.

The annual prize giving of the Provincial Forest Service and Ranger Class was held at the Forest College on March 31st, 1925. Mr. Rodger, O.B.E., President of the Forest Research Institute and College, presided and opened the proceedings with the following speech:—

" LADIES AND GENTLEMEN,—

I must first of all express my regret that neither the Hon'ble Member nor Sir Peter Clutterbuck were able to be present with us to-day. I had hoped also that Sir Narasimha Sarma would be here but he too was prevented from coming.

I have as you know been here only three months and have not been able to see much of the students in that short time. I hope, however, to be in camp with them a good deal in future.

The Provincial Class started in April 1923 with 16 students one of whom left last year to go to Oxford where we hope he will do well. The remaining 15 students have all got certificates but none of them have reached the Honours Standard. Generally speaking they have been fit and have done a great deal of jungle work, having toured in the Dun, Jaunsar and Etawah. Their last tour was to South India, Nilambur, Olavakkot, Bangalore, Coorg and Ootacamund, and the working Plan was made at Asarori on the Estate of Lala Balbir Singh.

The Rangers started with 20 students of whom 3 were found incapable of following the course and one resigned. The class is of good average quality and Arjan Singh has distinguished himself greatly and will, I have no doubt, be an excellent forest officer. Five Honours have been gained and only one student has failed to get the Higher Standard Certificate. This class toured in Ranikhet, Jaunsar, Etawah, and in the Kheri, Gorakhpore, Haldwani and Pilibhit Divisions. As usual they also did a great deal of forest work in the Dun, where they helped the Senior Provincial Class with their Working Plan.

In both classes I am afraid the tendency has been for students to depend too much on book learning, and this has been very evident in the examinations. The questions in both the oral and written papers are chosen so that we may find out what

the students know. We have no desire to catch students out, nor do we set questions so as to puzzle them. We wish to obtain from students a clear answer to the questions and I am sorry to say it is a common fault for students to write down something they know whether it answers the question or not. This has been specially noticeable in the Silviculture examinations. Students should answer questions so as to display their knowledge, not so as to conceal their ignorance. This is a very important point. I should like the students in future when in the forest to make a practice of keeping their eyes open all the time and drawing their own conclusions from what they see. Every man has eyes, and students' eyes may well be as good as an Instructor's. We shall think more of you if you tell us what you have deduced from what you have seen in the forest, than if you merely tell us what you have learnt from a book. Don't be afraid of saying something wrong. No man who is in terror of making a mistake ever did anything great. You will not lose marks, in oral or written papers, if you show that you have kept your eyes open, and have thought matters out for yourself, even if you are not always quite right in your conclusions. That comes with experience, and a very great deal of experience, and never forget that when you leave here to take up a post in a Division, you are just *beginning* to acquire a knowledge of forestry.

The Inspector-General's Cup for the best all-round athlete has been awarded this year to Herbert Dudt, student of the Provincial Service Class, and I think this award will be generally supported.

We must tender our thanks to all the Forest Officers who have helped us during our tours in their divisions. Amongst them I may mention the Divisional Forest Officers of Jaunsar and the Dun ; Major Chipp, Ranger Chengappa of Coorg, the Ranger at Suini, Ranikhet, the Rangers in Jaunsar and the Divisional Forest Officers of Kheri and other Divisions in Oudh and Kumaon, and Ranger Ramrathan of Ramgarh.

With regard to the Working Plan made at Asarori for Lala Balbir Singh he has very generously presented three gold medals to the students, two to the Provincial Class and one to the Ranger Class, and our hearty thanks are due to him for this

generous gift. The Working Plan will we hope be of great value to him in running his estate and the work was excellent practice for the class.

We have with regret to record the departure of three Instructors who have left since last prize day—Mr. Trigg who has gone to the Andamans, Mr. Parkinson who has returned to Burma and Mr. Joshi who has gone to take charge of the Bahraich Division in the U. P.

As the Hon'ble Member and the Inspector-General of Forests have been unable to come, it is my pleasant duty now to distribute the prizes and certificates."

The certificates, medals and prizes were then presented by the President to the following successful students:—

PROVINCIAL FOREST SERVICE CLASS OF 1923-25.

Honours.

No award.

Pass Certificates.

1. Sant Ram Bakhshi ... ... (Punjab).
2. Jalmeja Singh Majithia ... ... Do
3. G. G. Brinsley ... ... (Trinidad).
4. Sohan Singh Negi ... ... (U. P.).
5. Jaswant Singh ... ... (Punjab).
6. Ram Saran ... ... Do.
7. Herbert Dudt. ... ... (U. P.).
8. Manohar Lal Mattu ... ... (Punjab).
9. Hari Singh ... ... Do.
10. Kyaw Din ... ... (Burma).
11. M. Seshagiri Rao ... ... (C. P.).
12. Mohammad Akram ... ... (Punjab).
13. J. P. Cook ... ... (Burma).
14. Ram Chand Bhatia ... ... (Punjab).
15. M. J. Rosair ... ... (Burma).

RANGER CLASS OF 1923—25.

Honours.

1. Arjan Singh ... ... (Punjab).
2. Sadhu Singh ... ... Do.

3. Ghulam Husain Khan ... .. (Punjab).
4. Indu Bhushan Maitra ... ... (Bengal).
5. Bhawani Singh ... ... (Punjab).

HIGHER STANDARD CERTIFICATES.

6. Sharif Ahmad Khan ... .. (Punjab).
7. Akshay Kumar Guha ... .. (Bengal).
8. Bachaspati Nautiyal ... .. (Tehri).
9. Satya Charan Sharma ... ... (U. P.).
10. Karm Chand Sharma ... .. (Punjab).
11. Shanker Datt Ojha ... ... (Panna).
12. Sundar Das ... ... (Private).
13. Thakur Dass ... ... (Punjab).
14. Vidya Sagar Joshi ... .. (U. P.).
15. Narain Datt Nautiyal ... ... (Tehri).

LOWER STANDARD CERTIFICATE.

16. Dev Prasad Vishvanath Rushi ... (Chhota Udeypur).

MEDALS AND PRIZES.

PROVINCIAL SERVICE CLASS OF 1923—25.

Silver Medal for *Forestry*	... G. G. Brinsley	... Trinidad.
„ „ „ *Botany*	... Herbert Dudt	... U. P.
„ „ „ *Engineering*	... G. G. Brinsley	... Trinidad.
„ „ „ *Surveying*	... Jalmeja Singh	... Punjab.
Hill Memorial Prize for *Silviculture*.	G. G. Brinsley	... Trinidad.
'Indian Forester" Prize for *General Proficiency* (Best student, who has not received any other prize)— Silver wrist-watch	... Sohan Singh Negi	... U. P.
The Hon'ble Member's Prize for general proficiency in all branches of *Forestry*— Silver wrist-watch	... Sant Ram Bakhshi	... Punjab.

McCrie Memorial Prize for the best student in *Working Plans*—		
(*a*) Forest Valuation by Chapman,		
(*b*) Forest Management by Recknagel, and		
(*c*) The Theory and Practice of Working Plans by Recknagel.	Ram Saran Chopra ...	Punjab.
Inspector-General's Cup to the best all-round *Athlete*.	Herbert Dudt ...	U. P.
Gold Medals presented by L. Balbir Singh Rais for the Working Plan of his Asarori Estate—		
To best Provincial Student ...	Ram Saran Chopra ...	Punjab.
To second best Provincial Student	Sohan Singh Negi ...	U. P.

RANGER CLASS OF 1923—25.

Gold Medal for highest marks, with *Honours*.	Arjan Singh ...	Punjab.
Fernandez Gold Medal for *Utilisation*.	Ditto ...	Do.
Silver Medal for *Forestry* ...	Ditto ...	Do.
„ „ „ *Botany* ...	Ditto ...	Do.
„ „ „ *Engineering*	Sadhu Singh ...	Do.
McDonnell Silver Medal (Best *Punjab* or *Kashmir* student).	Arjan Singh ...	Do.
William Prothero Thomas Prize for the best practical Forester (Brandis, "Indian Trees").	Indubhushan Maitra. ...	Bengal.
"Indian Forester" Prize for the best student who has not received any other prize—		

(Despatch Box)	...	... Ghulam Hussain Khan.	... Punjab.
Gold Medal presented by Balbir Singh Rais for the Working Plan of his Asarori Estate to best Ranger Student.		L. Arjan Singh	... Do.

After distributing the prizes and certificates the President closed the proceedings with the following remarks :—

"LADIES AND GENTLEMEN,—

Before concluding I must express the feeling, which I knew you all have, of the great loss which has been sustained by the departure of Mr. Perrée. He has worked here whole-heartedly for 5 years for the Institute and College. Last year he said he must leave others to judge whether his efforts had been attended with success, and I know that I express your feelings when I say that there is no doubt whatever that the greater part of the progress made during the last 5 years have been due to Mr. Perrée's wise and sympathetic leadership. I know that you will all join with me in wishing Mr. and Mrs. Perrée long life and happiness in their retirement. I must also express to the whole staff of the College and of the Research Institute Mr. Perrée's grateful recongnition, and my own, of the great pains all the members have taken to make the work of the College a success.

Mr. Pearson leaves to-night on long leave and I know I shall be expressing your feelings when I offer Mr. and Mrs. Pearson our best wishes. Mr. Pearson has, as you know, throughout his long service at Dehra Dun, been of the greatest assistance to the President in the conduct of the College.

It is interesting to note that since the College was established 45 years ago we have given 1,600 certificates for Forestry, so that the students who are now leaving are following in the foot-steps of a body of forest officers, many of whom have attained distinction. You are joining a service to which it is an honour to belong.

To the outgoing students of the two classes I wish a long and prosperous career in a life which is, I am quite sure, one of the best a man can choose."

The students and guests were then entertained by the President to tea in the grounds of the College which were looking their best, the flower beds being greatly admired.

BAMBOOS IN THE CHITTAGONG HILL TRACTS DIVISION BENGAL.

The following species of bamboos are extracted from the Chittagong Hill Tracts Division for use in Chittagong :—

1. *Bambusa Tulda*, locally known as *metenga* grows gregariously in all the Reserves. The height of the culm in 30′—80′ and diameter 2″ to 4″. It is used for house-posts, rafters and basket-making. It is abundant in the Kassalong and Sitapahar Reserves, but on account of its large size extraction is limited.

2. *Oxytenanthera auriculata*, locally known as *kaliseri*. It is a large bamboo and grows plentifully in the lower part of the Kassalong Reserve. The culm is dark green streaked with yellow 30′ to 60′ high and is used for making the walling of houses, floors and basket-work.

3. *Dendrocalamus longispathus* locally known as *orah*. A large and often gregarious bamboo growing in open clumps, culm light or dark green, 50′—70′ high and 4″—6″ diameter. It has a large cavity between the nodes and is locally used by hill people as receptacles for carrying water and milk. It is also used for house-posts, baskets and mat-making.

4. *Melocalamus compactiflorus* locally known as *lota*. It is a climbing bamboo and abundant in the upper part of the Kassalong and Ringkhoong Reserves where it is doing as much damage to the timber trees as creepers. It is locally used for making small baskets by the *Chakmas*.

5. *Teinostachyum Dullooa* locally known as *dolu*. It is a medium-sized to large bamboo growing in open clumps. The culms are dark green and 30′—50′ high and 2″—5″ diameter

The hollow part of the cavity between the nodes is big and long and used by bamboo-cutters and hill people for carrying water. It is used for wall and floor-making, for basket-work and rafting cotton, sun grass, timber and vegetables, etc., in small and shallow streams by the hill people. Ten to twelve lacs of *dolu* bamboos are used annually for sun grass rafting from the Kassalong Valley to Chittagong.

6. *Melocanna bambusoides* known here as *muli*, *paia* and *awarja* (*Chakma*). A medium sized or large bamboo growing not in clumps but gregariously in separate culms arising from branches and spreading rhizomes. Culm green when young, and yellow when old; 30′—70′ high, 1″ to 3″ diameter; used for walling, floor making, *tharja* roofing, fencing aud basket works and also used for rafting timber in shallow streams.

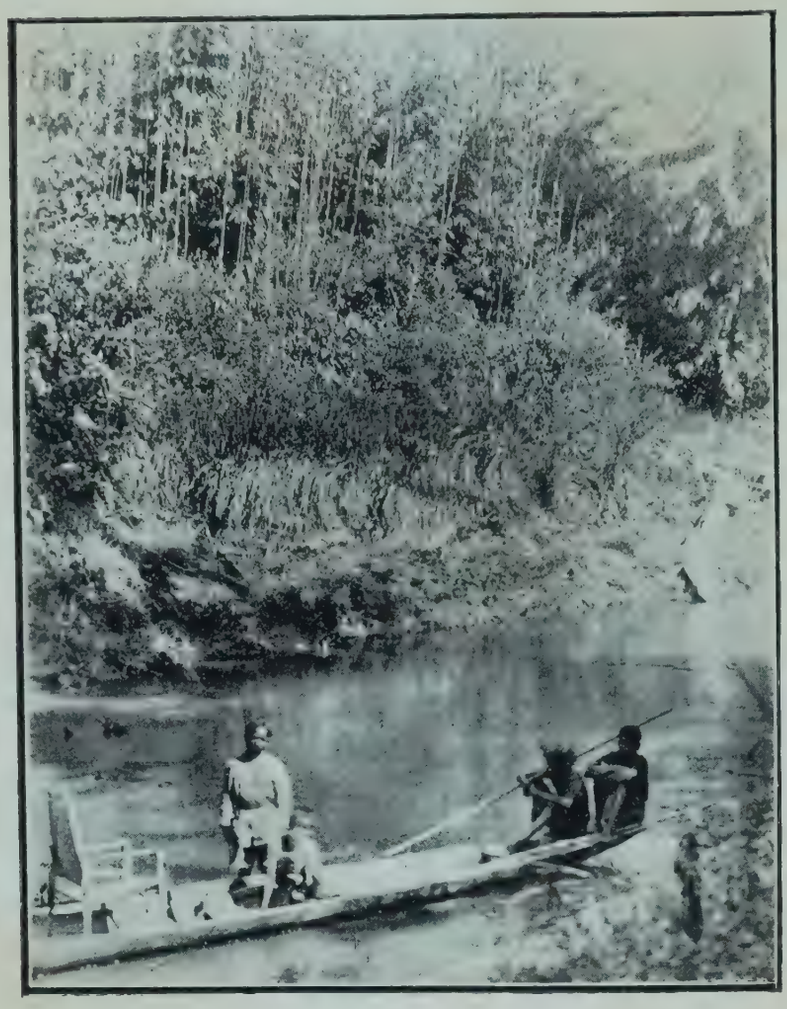
These are the principal species of bamboos now in use in the Chittagong Hill Tracts, besides them the following species are also in use:—

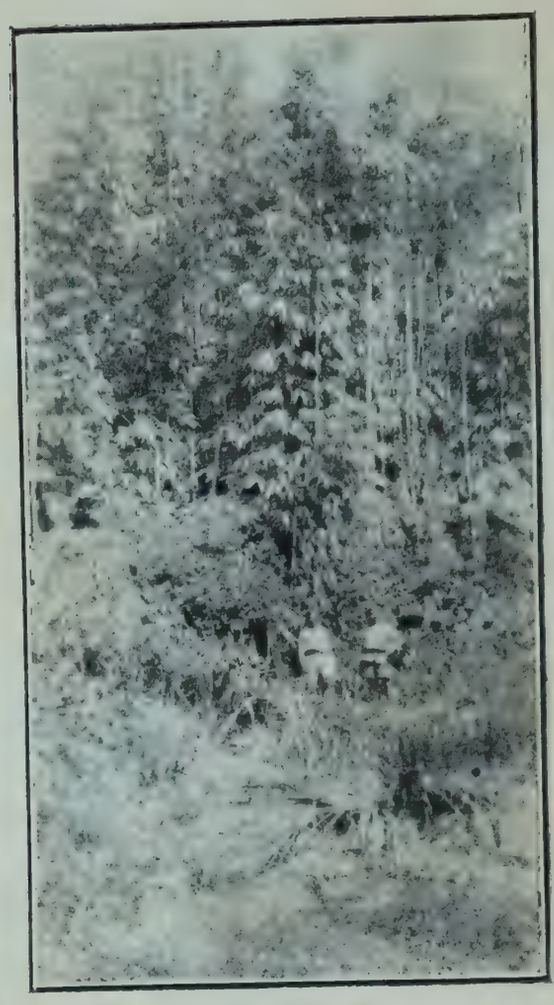
(1) *Teinostachyum Griffithii*, locally known "*Bazali*".

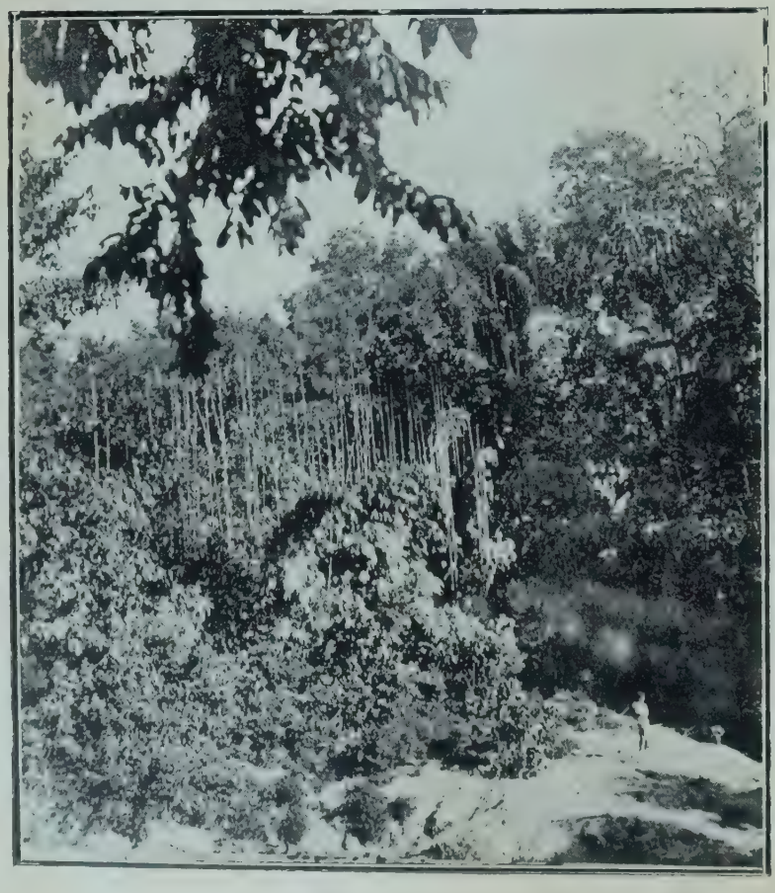
(2) *Bambusa vulgaris* locally known "*barialla*".

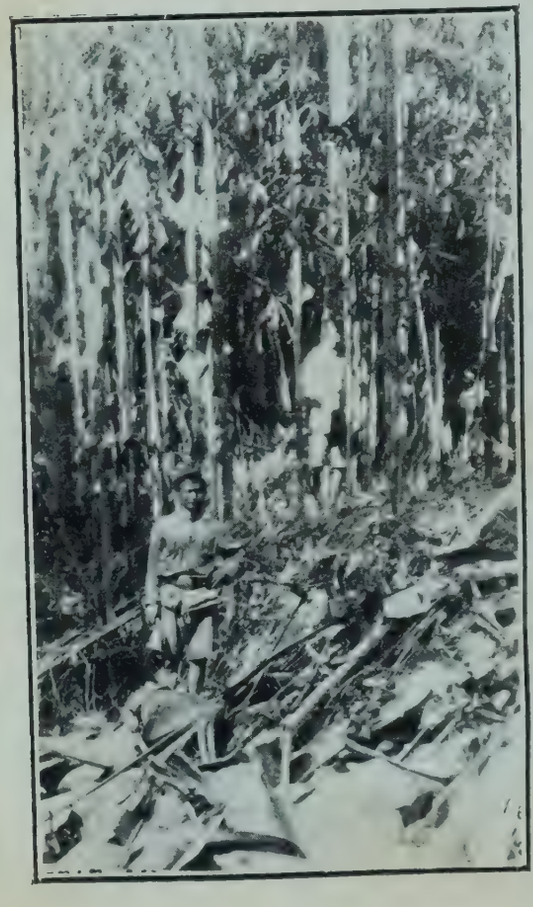
System of working.—The Chittagong Hill Tracts is by far the biggest bamboo growing area in Bengal and the inhabitants depend entirely on the bamboos for making their houses. At present the bamboos in the Reserve forests are worked under a rotation of 3 years. The biggest bamboo forest in the Kassalong Reserve has been leased to India Paper Pulp & Co. from 1st January 1920. They have been allowed to cut and remove all the species of bamboos except *dalu* which has been kept for rafting sun grass. All bamboos from the other Reserves as well as from the Unclassed State Forests have been cut and removed by the public on royalty system. The Working plan has been introduced in this Division from 1923 and the working of the bamboos is now done according to the plan. The royalty is realised at a fixed rate sanctioned by the Conservator of Forests, Bengal.

Scarcity of bamboos.—The price of bamboos in the Chittagong Hill Tracts has gone up recently. The price of bamboos was in









Photos. by M. C. Chaudhuri.

Fig. 1. One year old Bamboo in a jhumed area in Agaratum (*Eupatorium*) in Maini Head Water Reserve, 15th November 1923.

Fig. 2. Two year old Bamboo in a jhumed area in Agaratum in Maini Head Water Reserve, 14th November 1924.

Fig. 3. One year old Bamboo in a jhumed area in Agaratum in Maini Head Water Reserve, 15th November 1923.

Fig. 4. Two year old Bamboo in a jhumed area in Agaratum in Maini Head Water Reserve, 14th November 1924.

1919-20 from Rs. 16 to Rs. 40 a thousand, but in the current year the price is as follows :—

Mainimukh	Muli	Rs. 80	a thousand.
	Dalu	Rs. 120 to 150	do

The price of bamboos at Mainimukh is high, because the bamboos are required for rafting sun grass. The price of *muli* bamboos at Chandraghona is Rs. 40 to Rs. 60 a thousand at present.

Statement showing the number of bamboos extracted from the Chittagong Hill Tracts Division and the revenue received.

Year.	Number of bamboos extracted.	Revenue realised in C. H. Ts. Dn.	Total revenue on bamboos in Bengal.
	Rs.	Rs.	Rs
1919-20	78,73,205	36,184	73,105
1920-21	65,07,877	31,944	81,243
1921-22	100,96,729	42,704	98,444
1922-23	100,32,322	57,073	1,11,349
1923-24	101,66,413	54,947	91,953

The bamboo statement shows that nearly 50 p. c. of the total revenue on bamboos is actually realised from the Chittagong Hill Tracts Division.

The bamboos in the Hill Tracts have been destroyed by jhuming. We have reserved about 135 sq. miles of jhumed land in the head waters of three streams as reserved forests and I found that bamboos are coming up among the Eupatorium plentifully. I have seen the bamboos in 1923 and 1924 in the same jhumed area and found that they are doing well and there is every chance that the jhumed area if protected can easily be filled up with bamboos within 2 or 3 years. By burning the rhizome is not killed and can give out shoots as soon an burning in stopped.

Seedlings of bamboos :—It was noticed in this part of the forest that *orah* and *metenga* bamboos flowered sporadically everywhere. No regular flowering is noticed all over the area. During

my stay of over 5 years as Divisional Forest Officer I have noticed every year that the *orah* and *metenga* bamboos produced flowers in some part or other.

Reproducton.—The natural reproduction of *orah* and *metenga* and *dalu* is very favourable in the Reserved Forest of the Chittagong Hill Tracts.

Enemies.—Elephants cause heavy damage to bamboos all over the Kassalong Reserve by uprooting the clumps especially on ridges and destroying all the young shoots by twisting and crushing. Elephants are plentiful both in Kassalong and Ringkhoong Ranges and in both places damage is heavy. It is desireable to run a regular Kheddah operation to stop this damage.

The following statement will show the revenue realised and numbers of bamboo extracted during last 5 years from the Sitapahar Reserve (known as Kaptai Forests), the area of which is 21 square miles and the actual bamboo area will be about 15 square miles and is worked under a rotation of 3 years, *i.e.*, 5 square miles worked a year :—

Year.	Number of bamboos extracted.	Revenue realised.
	Rs.	Rs.
1919-20	17,75,470	8,072
1920-21	19,74,061	7,998
1921-22	20,66,685	9,681
1922-23	26,46,260	11,987
1923-24	29,84,111	15,005

In 1923-24 we obtained Rs. 15,005 for the total area of 15 square miles, *i.e.*, Rs. 1,000 per square mile which gives an annual income of Rs. 1-8-0 per acre for bamboos. This Reserve is the only easily accessible forest and so has been worked out completely.

Special quality of bamboos.—The bamboos in other parts of the country are attacked by borers (called *Ghoon*)* but in the Hill

* The common bostrychid borers of bamboo, *Dinoderus brevis*, *D. minutus* and *D. occellaris* appear to be absent from the Chittagong Hills.—*Hon. Ed.*

Tracts I have not noticed the bamboos attached by borers, although they are used for walling, roofing and keiling of houses all over the Hill Tracts and Chittagong Districts.

M. C. CHAUDHURI,
Divisional Forest Officer,
Chittagong Hill Tracts.

12th March, 1925.

THE APOCALYPSE.

A JUNGLE OF BEAUTY.

It has probably never occurred to those bright people who concoct Working Plans, what very drab reading their jungle impressions make as recorded in Compartment Histories. We can readily excuse, if we do not condone, those technical fantasies and quaint conceits peculiar to Chapter Six, Part One of their Magnum Opus. Indeed from that happy hunting ground of our senior wanglers, many expect, and even welcome, vagaries. There is a world of comfort in the thought, as one plunges perspiringly through a jungle of absurd density (perforce playing a sort of "Oranges and Lemons" with the local creepers) that the 600 odd acres awaiting the clasp of one's calliper are really *tiny* little fellows (considering their reduced quality, you know) forming an area about the size of a brace of Sample Plots. We must all, too, feel a warm sympathy for the jungle itself, which not only forms a number of Circles but is expected at the same time to become a right-angled triangle with a baser. That it will abandon this Pythagorean project if we neglect its small-wood, should, in these days of organised minorities, occasion no surprise. And the matter, it seems, is merely one of a growing stock of grievances.

But, as I've said, our Compartment Histories are pitiful starved things. They all read alike—colourless, uniform socialised. Take the following :—

"On the eastern slopes (below the Raddi Rau) the soil is more loamy and carries an ample crop of miscellaneous species at least 50 years old and requiring thinning badly ; well-grown young Sain are also found in different parts but are absent on

stony ground. Grassy *tappars* are scattered everywhere. Damage from *Gauj* is decreasing owing to systematic cutting in the past. . . ."

—and so on, *ad nauseam forestatem.*

Now, that this is all the jungle presents even to our unseeing gaze, I do not for a moment believe. We are victims, surely, of colossal self-deception, of an immense fraud. For there are those in my office to whom the full beauties of an Indian Jungle are gloriously manifest. To realise the immensity of our loss, and the wickedness of an official policy, or tradition, suppressing the true facts of Nature, I propose to submit the sublime original from which the above vapid emendation sprung. Compare sickly child and radiant mother! (Family forward please.) The archetype is as follows :—

"In the cistern slops (blow the raddi rau) the soil is more loomy and carries an apple crop of miscellaneous spices at least 5,000 years old and requiring thigging ; blady well-gug-grown young Sinner also found ; indifferent pats butter absent on sconey ground. Glassy *stoppers* are scattered everywhere. Damage from *Gorjes* decreasing owing to systematic catting in the past. . . ."

Comment on a masterpiece of this nature is almost an impertinence. Here, surely, is an area to show with pride to one's touring Conservator and to the experts in saxaphone symbology for Sal ! There is a freshness, almost a baza. . ..(I never can spell it—thank you) a *bizarre* touch in this Compartment description which sets it apart from all others. It is quite unique in its, er, uniqueness. Indeed several passages in it are well worthy of Milton (I refer, of course, to the poet not to the disinfectant).

A note of Eastern mystery pervades the writer's theme. Passing over the "slops" (a habit to be recommended) we pause at "loomy" and recall the Jabberwock Epic which puzzled Alice so. Whatever this obscure terrestrial quality, keen silviculturists will note the resulting apple crop, complete with spices, and a dynastic rotation which only their presence can excuse. These apples must taste lovely and any "thigging" is to

be deprecated. Somehow it sounds drastic (" Thugging?" Ed.) Neither they nor the butter (inconsiderately absent on "sconey" ground) have ever come my way in the jungle. Still, this would account for so many butterflies . . . Next inspection I really must take an empty barrel with me . . . . . or at least an empty stomach and an unbiassed mind.

But there is more immediate food for thought in the preceding passage. The, er, " . . . . . well-grown young Sinner," referred to with emphasis and some emotion, fills me with mystification and a mild alarm. To repudiate the innuendo is my first duty ; to establish an alibi the second. This Division is so well served by roads that to enter a Compartment is an obsolete and quite unnecessary proceeding. Besides, this cannot, I am sure, refer to a Forest Officer, however well-grown. An *ordinary* sinner, perhaps : but one with a large " S " never. No Forest Officer ever has any capital.

In the " glassy stoppers " we strike a Western note (though a cork is now-a-days more favoured) and their regrettable abundance argues a widespread movement of char-a-banc trippers imbued with O. K. (Omar Khayyam) principles. At least no other explanation is suitable.

On the writer's style and choice of words I speak with diffidence. The telegraphic brevity of the whole is much reminiscent of Carlyle, the robust, almost strong language of—well, *not* of Carlyle at any rate. That the passage opens on a note of impatience, and even irritation, must be conceded ; and certain expressions, while admittedly familiar to me (and possibly to others) in a different connection, I have not hitherto encountered in an Epic work of this nature. However, it is not ours to criticise. In the words of the proverb, " Those who live amongst glassy stoppers should not throw stones," and we would not wish even to drop a brick. That forcefulness which a great theme demands must be accorded full scope. One cannot, however staunch to the Eighteenth Amendment, license the Gods drinking nectar on Olympus.

The actual author I wish I could acclaim. But it seems he represents a *type* rather than an individual, that he casts his wonderful spell in many a prosaic office. For the rest, I may

submit one more touch, enlightening yet mysterious, from the masterhand. Such well-worn, nigh meaningless, words as "Both areas should be included in the First Periodic Block"—a phrase familiar to us even in the Nursery—obscure a world of poetry or rather of music. In their pristine beauty we read "Bach arias should be included in the Forest Pocket Book."

Here in a sentence we U. P. forest officers learn the catholic range of our little green friend. Its months of faithful service as a prop to the leg of my piano appear prophetic. For truly, in its elastic band and wide range of notes we now perceive a fresh significance, and glimpse for a moment the harmony of things forestal.

φορδι.

Important note.—I have just discovered that the whole thing is, after all, a mistake due to someone's carelessness. This disclosure is necessary if only to anticipate promptly the rush of experts to my Division, which would have caused me endless inconvenience, besides damaging the jungle. A slight amendment of the title may be suggested. For "Apocalypse" read "A pukka lapse," followed by "A bungle of duty".

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THE EMPIRE FORESTRY DINNER, 1924.

ABSTRACT FROM THE TRANSACTIONS OF ROYAL SCOTTISH ARBORICULTURAL SOCIETY.

As soon as it had been decided to hold the annual Excursion of the Royal Scottish Arboricultural Society in London, the suggestion was made that it would be a good opportunity for some sort of joint meeting with our sister Society in England, and it was eventually decided that this should take the form of a visit to the Forestry exhibits at Wembley, on Thursday, 26th June, followed by a dinner at our headquarters the same evening. The arrangements for this were well in hand when an advertisement was noticed of an Empire Forestry Dinner to be held in London, on the 27th June. Thinking that this was probably being organised by the Empire Forestry Association, the Secretary wrote to that body and learned that the originators of the

proposed dinner were a number of forest officers from our services overseas who were present in London in connection with Forestry exhibits at Wembley, and that the Empire Forestry Association was co-operating with them. The combining of these two dinners seemed the obvious thing to do, and thus it was that on Thursday, 26th June 1924, the Empire Forestry Dinner was held in the Imperial Hotel, London, under the joint auspices of the two Arboricultural Societies, the Empire Forestry Association, and the Forest Officers of the Empire Overseas.

The task of arranging the details fell mostly upon Mr. Corbett, the Secretary of the Empire Forestry Association, as he was on the spot, and the society is much indebted to him, for the willing and able manner in which he undertook the extra work involved. The Society's thanks are also due to Captain Borthwick, who kindly designed the menu card.

It was at one time hoped that H. R. H. The Prince of Wales would be present, in his capacity of Hon. President of the Empire Forestry Association, but his Royal Highness was prevented by another engagement. The Right Honourable William Adamson, M. P., Secretary for Scotland, promised to attend and represent the Government, but was unfortunately detained in the House by important duties. Sir John Stirling Maxwell, Bart. of Pollok, presided, and amongst those present were the Duke of Atholl, Lord Lovat, Professor Somerville, the Rt. Hon. A. H. Ashbolt (Agent-General for Tasmania), Sir William Schlich, K.C.I.E., Professor Henry, Dublin, Professor Stebbing, Edinburgh, Mr. R. L. Robinson, Dr. Borthwick and Mr. Story, Forestry Commission, Mr. A. Rodger, I.F.S., Captain Blunt, Sudan Forestry Service, and others, together with the Excursion party. In all about 250 were present.

The Chairman in proposing the toast of H. M. Govt. said that no gathering of foresters could have taken place on such a scale before the war. Our race had hitherto been a race of forest destroyers and it would take time to turn it into a race of foresters. It is never easy to educate any Government where imagination and foresight are required, but it is especially difficult when the subject is one in which the returns are so slow and the

votes so few. We do not accuse our statesman of lacking goodwill. What they really suffer from is lack of time, and when so many other subjects are being brought powerfully to their attention it is not wonderful that they should have no leisure to listen to the gentle voice of the Forester. In this country, but for the war, it is probable that we should not now have passed the stage of inquiry in forestry. That inquiry went on for years and years as we all know. The Forestry Act lifted us suddenly into the sphere of action. That Act had the support of every party in the State, a fact which is not only a great delight but is also a great encouragement to foresters. It also places a very strong obligation upon those who have to carry the Act out to make it a success.

The Rt. Hon. A. H. Ashbolt (Agent-General for Tasmania), proposed the toast of "Forestry" and remarked that with their immense natural forests, the Dominions and Colonies were inclined to be still despoilers of forests, and that it was only by studying conditions here that they were beginning to realise the imminence of a timber shortage and the need for re-afforestation. He was going back a convert to afforestation. The main theme of Mr. Ashbolt's speech was Reciprocal Preference between the Colonies and the Mother Country, which he claimed to be a subject worthy of a higher place than a matter of party politics; commerce and friendship should be bound together into one common tie uniting all the parts of the Empire.

Lord Lovat, replying on behalf of the Forestry Commission, said that the foresters of the Empire had been brought together twice in the last four years at the Imperial Forestry Conferences. At these Conferences it had been decided, among other important matters, that, in view of the increasing world shortage of timber, immediate steps should be taken to find out what our Empire resources actually were. Investigations had now been begun and he hoped the next Conference, in five years' time, would have a much more exact knowledge of the position. Lord Lovat expressed the opinion that the day was not far off when the cultivated forest would be more important than the natural one. A significant fact to note was, that we in Great Britain had actually planted more land than the total of that planted in the United States and Canada.

Before calling on several speakers to reply on behalf of their respective societies, the Chairman said :—"Gentlemen, before I call on the Duke of Atholl, I should like to explain that the order in which these toasts come is not due to the fact that so many of my fellow-countrymen from the North happen to be in the company. The responses are placed in the order of seniority, not because we put Scotland first, and the Empire last, and England in the middle. I have to call upon the Duke of Atholl who represents the senior Forestry society here."

The Duke of Atholl, Professor Somerville and Mr. A. Rodger replied on behalf of the Royal Scottish Arboricultural Society: The Royal English Arboricultural Society: the Empire Forestry Association and the Forest Services of the Empire, respectively.

Mr. Spiers replying on behalf of the Timber Trade, said he was convinced from what he had seen at Wembley that the Colonies could produce all we required in the way of timber, but he felt that we could produce a great deal more at home.

Mr. Charles Buchanan, Convener of the Excursion Committee, then rose to propose the health of the Chairman. In the course of a short speech he referred to Sir John Stirling Maxwell as one of the ablest foresters and proprietors in Scotland, whose worth was recognised by all the Societies.

Sir John Stirling Maxwell in replying said, "I do not suppose that any more representative gathering of Empire foresters has ever met on the occasion of an excursion of our oldest Forestry Society—I mean the Scottish Society. By a happy string of accidents the dinner has expanded into something quite different from the annual one, as here we find the interests of the Empire represented as well as our particular interest at home. I would like to endorse what Mr. Rodger said just now about the Empire Forestry Association. The object of that body is to link together the foresters of the Empire who have so few opportunities of keeping in touch with each other. The suggestion which Mr. Rodger made to-day of a club was new to me, but it seems a very good one on the face of it. I hope that in the course of the next few months every forester who takes an interest in the wider

aspect of our calling will enroll himself as a member of that Association."

This speech brought a most successful evening to a conclusion.

THE SILVICULTURIST'S MUSEUM, DEHRA DUN.

We are asked to state that the Silviculturist, Forest Research Institute, Dehra Dun, would be much obliged if Divisional Forest Officers would inform him when the come across silvicultural curiosities suitable for a museum.

HON. ED.

OBITUARY.

HERBERT COMYN WALKER.

The Forest Department in Burma has suffered a great loss by the death of Herbert Comyn Walker, Conservator of Forests, from enteric, at Maymyo, on the 25th April 1925. Walker was educated at Rugby and entered Cooper's Hill in 1896. He passed out from Cooper's Hill in 1899 and joined the Service in Burma in December of that year, being posted to Prome. After serving as assistant in Tharrawaddy and Moulmein and for a short time in the Andamans, he was posted to Working Plan duty in the Thaungyin for one season. From 1905—1908, he was in charge of Yaw Division and then held Rangoon Division for one year and Arakan Division for 2½ years. On return from leave at the end of 1914, he took over charge of the Upper Chindwin Division, which he held for five years before officiating as Conservator in the Southern Circle. On return from leave in 1921 he became Conservator of Delta Circle. He was confirmed as Conservator in December 1921, and was transferred to the charge of the Northern Circle in 1924. Walker was a man of

unusual ideas which he gave frequent vent to in the *Indian Forester*. Probably his most valued contributions to controversial subjects were on the question of fire-protection. He was always a strong opponent of wholesale fire-protection and undoubtedly had considerable influence in the change of opinion on this question in the Department in Burma. Latterly he has taken up the challenge against the selection system as adopted in Burma and has been a warm supporter of this system against its detractors. In his quiet way Walker was an enthusiast for the profession of Forestry. Private employment in another sphere was open to him, but he preferred to stick to his job. He was universally popular and was most sympathetic to his assistants and subordinates. At his death he was acting as President of Maymyo Club in which he took considerable interest; his death has caused great sorrow in Maymyo and among his many friends in Burma. Walker married in 1920 and had two children, a girl born in 1921 and a boy born only last January. Much sympathy will be felt for his widow and children.

* * * *

The Government of Burma records with deep regret the death at Maymyo on the 25th April 1925 of Mr. Herbert Comyn Walker of the Indian Forest Service, Conservator of Forests, Northern Circle. Mr. Walker joined the Forest Department in Burma as an Assistant Conservator in 1899. He was selected for the post of Conservator in 1921. Throughout his service he showed himself to be a zealous and efficient officer deeply interested in his work and full of ideas. His Excellency the Governor and the Hon'ble Minister in charge of the Forest Department desire to express their appreciation of Mr. Walker's devotion to his duty and their sense of the loss which the Government of Burma and the Forest Department have sustained by his untimely death.

REVIEWS.

RIVER TRAINING IN BURMA.

REGULATION OF RIVERS WITHOUT EMBANKMENTS, by F. A. LEETE, C.I.E., I.F.S., Chief Conservator of Forests, Burma, assisted by G. C. CHEYNE, I.F.S., Deputy Conservator of Forests, Myitmaka Division, London, Crosby Lockwood and Son, 1924, pp. 122, 10 Maps, 9 diagrams, 36 plates. Price 30 shillings.

This handsome volume published by Crosby Lockwood & Son will take its place with the classics of Indian Forestry from the hands of Brandis, Gamble, Troup and others. It describes clearly how a number of very troublesome streams in Lower Burma were made to behave themselves. For many years these streams on issuing from the Pegu Yoma Range, had always during the rains divided into many small channels, overflowed their banks, and carried the Government teak logs far and wide across country. The difficulty was increased by the flood water from the Irrawaddy and the Rangoon rivers which dammed up the smaller rivers and increased the accumulation of water on the plains. In a few words, what Mr. Leete and Mr. Cheyne did was to devise several most ingenious methods whereby these streams were induced to cut good clear beds for themselves, so that without great expense they brought out the timber to the main floating stream. The frontispiece gives a good idea of what wonderful work it was, showing the Taungnyo (brown-hill) stream flowing between eleven-foot banks, although the channel is only 5 years old and the banks are entirely composed of the rivers own deposits. In his Preface Mr. Leete says, "Control without embankments cannot be effective with all kinds of rivers. It is only applicable to streams which start as hill torrents heavily charged with sandy silt. Such streams are everywhere subject to variations in flood levels and in high floods overtopping of the banks is common. In tropical countries, with the greater part of the rainfall confined to half or less than half of the year, hill streams are torrential in character, and bank overflow is very

frequent indeed. After every storm the streams come down in spate, and it is a common occurrence for the flood waters, after leaving the hills and reaching the lowerlying parts of the plain, to spread far and wide over the country side."

"Although the Myitmaka Training Works were started by the Forest Department of the Government of Burma for the purpose of floating out teak logs, the operations have proved to be so remarkably successful in the protection of cultivation from flooding, and in the reclamation of lowlying and swampy land, that they would certainly be continued even if the rivers ceased to be of importance for logging purposes."

"The one outstanding persona.ity in the operations is that of Mr. G. C. Cheyne, I.F.S. He has been intimately connected with them from the start, first as timber Assistant and later as Divisional Officer, Myitmaka Extraction Division. It it no exaggeration to state that the splendid results obtained have been due entirely to Mr. Cheyne's untiring efforts. The work has been strenuous, conditions arduous and the responsibility heavy. Mr. Cheyne has proved himself times without number to be the right man in the right place. The Government of Burma does indeed owe to him a great debt, which will, I trust, find suitable acknowledgment in due course."

Mr. Leete's attention was drawn to the problem in 1913 when he found that "no matter how many logs were put into the streams in the hills, the number of logs which reached Rangoon annually diminished steadily, and it looked indeed as though the operations were in danger of coming to a standstill." Attempts to control these rivers began in 1852 soon after the British came to Lower Burma and have continued at intervals ever since. The crux of the problem is the disposal of the sandy silt brought down from the hills in immense volume and the two great troubles to be overcome were the obstructions in the beds and the unevenness of the banks. By clearing the beds of all obstruction and by cutting a small leading channel across the shallows, the rivers were induced to keep on the line of their old beds when they came down in spate, and by dressing the bank level, the overflow was kept uniform and an even layer of silt was deposited on both sides, thereby raising both banks.

Streams which flow through densely wooded hills are peculiarly liable to have their channels blocked by obstructions, snags, immense heavy old roots, masses of dead bamboos and so on, and these were removed by blasting, cutting and burning. As for the more difficult part of the work, it is interesting to note that as long ago as 1877 the Deputy Commissioner of Tharrawaddy had an idea of the proper thing to do—and that is, to build small fences on both sides so that the silt will be deposited. The success of the work lies in two directions The teak logs come out as they are meant to do, they are rafted and sold in Rangoon and not lost in the mud. The other great advantage of the work is that the area under cultivation is steadily increasing. The streams drain an area of 560 square miles in the hills, which rise to about 2,500 feet, and are covered with teak and bamboo forests Since 1915 the silt brought down has rendered cultivable about 10,000 acres of swamp-land, and reclamation is proceeding steadily at the rate of two square miles per annum.

The Burmese word *Laha* is much in evidence. The accent is on the last syllable, and the word means a flat which is inundated annually, and is dry during the hot weather.

It is worthy of note that in 1909 the Conservator said he would not recommend the waste of Government money on training works until the protection of the catchment area had been fully assured by the prohibition of shifting cultivations. This was a very much mistaken view. The Karens did not cause much erosion, because their clearings were very quickly recovered by jungle. Jams of logs caused by the obstruction were of frequent occurrence and a good account of how a jam of 3,000 teak logs was dealt with by Mr. Cheyne is given on page 35. His principle was, as always, to make the river do its own works. A small crooked channel was made through the jam with great difficulty. When the water began to run down this, progress had begun, and gradually the stream increased and scoured out a channel. The logs as they were pulled out were put along the stream in the now famous "herring-bone" pattern. This method of disposal has been used a great deal by Mr. Cheyne with the object of directing the water towards the middle of the channel and encouraging the removal of

deposits. Some idea of the conditions in this tract may be obtained from the following extract:—

"A study of currents in the Myitmaka is of the greatest importance for officers in control of logs after they enter the Myitmaka from the hill streams. Lack of attention to this detail may result in excessive expenditure on booms, and this is a matter of some moment, because the number of logs used for the purpose runs into several hundreds, even if the greatest care is taken. On the other hand, if booms are not placed where required, large numbers of logs may go astray, causing extra expense and trouble in recovery. In such a vast network of swamps and jungle the possibility of logs being lost sight of altogether is by no means inconsiderable. It is to be remembered that boats are a necessity for the local population for the greater part of the year."

Several fine photographs show how ancient teak logs which had been burried for any period up to 60 years were recovered during these operations, and the value of these more than paid for the work done. The volume is illustrated with many maps, section drawings and photographs from which full details of this very fine work can be learned. The Government of Burma have drawn attention to the great economic value of this method of control.

They say, "This method, which was thought out by Mr. Leete and put into practice by Mr. Cheyne has been eminently successful and has added not inconsiderably to the economic welfare of Burma."

THE EFFECT OF GRASS ON THE GROWTH OF TREES.

THE EFFECT OF GRASS ON TREES, by A. HOWARD, C.I.E., M.A., Pro. Roy. Soc., B. Vol., 97, pages 284-320, Figs. 4, Plates 14—18. 1924.

This reprint from the Proceedings of the Royal Society will be read with interest by foresters. The experiments were made at Pusa and therefore the results apply primarily to the Gangetic alluvium. After the middle of the monsoon the pore spaces near

the surface of the soil become water-logged, percolation stops, aeration is interfered with, the absorbing roots in the lower layers of the soil die and only those in the upper few inches supply the tree with food material. During July and August there is a rise in the subsoil water-level and a rapid fall to normal in October.

To discover the effect of grass on trees, plots were laid out on which were eight species of fruit trees with and without grass, with grass but aerated by trenches, etc. The grass was *Cynodon dactylon*.

An examination showed generally that the trees possessed each two distinct root-systems, one superficial in the upper 18 inches of the soil, the other deep-seated and just above the water-table. Under clean cultivation there is only occasional activity of the absorbing roots in the superficial layer during the resting period of December and January. As the surface soil dries the absorbing rootlets in the superficial layer die and the deep-seated roots become active. From about the middle of March till the break of the rains only the deep-seated roots are absorbing though a fall of rain will cause temporary activity of the surface-layer. This deep-seated activity explains why so many Indian trees are able to start into active life in the dry hot weather and also why the leaves are so often pale in colour for there is a lack of nitrogenous material in these deeper soil-layers. During this hot weather period, grass is dormant and there is no competition. When the rains break both the superficial and the deep-seated roots are in full activity for a time. Late in July when the rise in the water table occurs the deep-seated actively absorbing roots are killed and from August to October only the surface roots are active. In October there is some renewal of the deep-seated root activity.

As grass growth and tree growth coincide except for the hot weather period, it will be seen that during the hot weather, when only the deep-seated roots of the trees are active, grass is not competing ; during the early rains grass will affect the surface tree roots but the deep-seated roots will still be active ; during August to October the grass will severely affect the trees as it will compete with the superficial roots and the deep-seated roots are rendered

inactive by the rise in the water table. For the remainder of the year there will be no competition.

A careful examination of the root-system of young trees showed that under grass a very weak superficial root-system was produced though the deeper root-system was well developed. As a result grass competed successfully ; it killed some species of fruit trees and greatly retarded others. The guava which forms superficial roots in spite of the grass was least affected.

The harmful effect of the grass on established trees is less but is still great. The order of susceptibility is much the same, that is those trees most affected in youth are most affected later. The fruit trees under grass (except the guava) form few active rootlets in the superficial root-system during July with the result that when the deep-seated root-system ceases to function in August the trees have nothing to fall back on.

The plots where aeration trenches were dug showed that aeration certainly mitigated the evil effects of the grass but did not eliminate it and the effect of the trenches varied with the species.

A careful examination shows that the presence of grass increases the amount of carbon dioxide in the soil air throughout the year and particularly during the rains, it reduces very considerably the amount of nitric nitrogen in the upper 18″ of soil where the superficial root-system should be actively absorbing and it reduces aeration. These three factors account for the harmful effects of grass on the fruit trees, and Mr. Howard conclusively explodes the soil toxin theory.

Certain observations are then given on forest trees which have been under grass for at least 18 years to ascertain "the nature of the weapons by which these trees are not only able to thrive under grass, but also to vanquish it, if allowed free competition." It was found that all the trees possessed the two root systems but whereas the grass seriously affected the activity of the superficial roots of the fruit trees (except the guava) these forest trees had apparently perfectly normal superficial root-systems able to compete for nitrogen with the grass during the rains. The final conclusion is " the character which distinguishes forest trees from fruit trees appears therefore to be the power possessed by the surface roots of the former to resist the harmful

effects of an atmosphere rich in carbon dioxide. That the roots of different species vary greatly in this respect is well known. So great is this resistance in the case of forest trees that the roots are able to reach the surface in the presence of a grass carpet in active growth and to obtain oxygen as well as a portion of the combined nitrogen available."

Mr. Howard's observations and arguments as to how exactly grass causes harm are convincing, and his diagrams drive the points home. In one matter only we are not in entire agreement with him namely when he instances the different behaviour of forest trees. His facts and observations cannot be disputed but there seems to be rather more to it. In early youth forest trees vary much in their power of competing with grass but many of them—the vast majority of them—are quite unable to compete if grass and trees are sown together on bare land. If fruit trees were sown as profusely and repeatedly as forest trees on grassy blanks we believe it possible that as many—or as few—would survive.

Mr. Howard's reasons seem to show undoubtedly why the young fruit tree cannot compete with grass, but his conclusion applies, it seems, with almost equal force to the young forest tree. That the young forest tree—even the *Sissoo*—can be easily killed out by grass we have proved repeatedly by experiment.

The different behaviour of the established tree we are inclined to believe is more a question of species and age than any fundamental difference between fruit trees and forest trees, though we cannot here back our statement by experiment. Mr. Howard bases his conclusions on observations on fully grown fruit trees grassed over in 1921 and compares them with forest trees known to have been under grass for 18 years. It would be interesting to know the ages of the fully grown fruit trees when they were first put under grass. If young forest plants were put under grass many would be affected just as the fruit trees were affected. Is it not possible that with both fruit trees and forest trees the harm done if grass were introduced would depend on age and vigour that at first introduction there might be with both forest trees and fruit trees few active rootlets in the superficial layers but that after some years the

tree might adapt itself sufficiently to develop a good superficial root-system. To the forester grass is a deadly enemy though there certainly are trees which can compete with it.

INDIAN BIRDS.

THE FAUNA OF BRITISH INDIA, BIRDS,—VOLUME II (second edition). By E. C. STUART BAKER, O.B.E., F.Z.S. &c.; Taylor and Francis, London, 1914, Price 30*s*.

The volume appeared nearly a year ago so this notice is somewhat belated and serious students of the subject have doubtless already read the reviews which have appeared in the various journals devoted to Ornithology and Natural History generally. In any case I only intend to deal with the work from the point of view of the ordinary forester who, like myself, is a more or less unscientific observer and field naturalist.

To begin with I would urge all foresters, who are not too near the end of their service and take an interest in the birds they see, to possess themselves of a copy of this work. It is one that is not likely to be superseded during the service of even the latest joined recruit. Like a good gun, rifle or fishing-rod it will see one through one's service.

The Author's preface to this volume contains two items of good news, firstly that the rate of production has been speeded up so that Vol. V, which concludes the description of species, should appear (if my calculations are correct) not later than October 1928 instead of August 1930 as originally promised; secondly that a sixth volume has been sanctioned to include, besides addenda and corrigenda, a full synonymy of all first references.

This promise of a synonymy may leave some field-naturalists cold and I confess that it would have held little interest for me a year ago, in fact I was rather pleased to see no references except to Blanford and Oates, at the head of each species when the first volume appeared. Since then, in Tibet, I tried to wrestle with Dresser's Palearctic Birds, Blanford and Oates Fauna and some recent tri-nomial lists all differing in nomenclature,

so that I more than once found that what appeared to be three birds in the lists was only one in the flesh. Hence my respect for synonymy.

There is little to remark about this volume other than what I wrote about Volume I. It has been pointed out to me that many of the birds occurring in the Sunderbans have not had that locality given under their distribution. I have asked the naturalist who pointed this out if he would be good enough to publish a list of Sunderbans birds in the Bombay Natural History Society's Journal, as it does not appear to have been done and he is in the best position to do so.

E. O. S.

CORRESPONDENCE.

[NOTICE.—Correspondents who wish their letters to appear in a particular number of the *Indian Forester* should ensure that they reach the Honorary Editor by the 15th of the previous month with a request to that effect.

THE GOALPARA FOREST TRAMWAY.

SIR,—I am directed to refer to the 4th number of Volume LI of the *Indian Forester*, for April 1925.

In that number there is an article on the Goalpara Forest Tramway, in which it is stated that the problem of bringing the sleepers from the north end at Kochugaon, so as to co-operate with the rails delivered at Fakiragram on the south, without using carts, was solved with some ingenuity by the Divisional Forest Officer.

A similar state of affairs is likely to confront this Government in respect of the projected forest tramway in South Raipur, since the sleepers will be mostly out of the forests to the southern part of the line, while the rails will be delivered at the northern and on the main railway. I am therefore to ask if you would be so good as to ask your contributor if he could supply this Government with some information as to the method adopted to produce the result stated.

I am to say that the Central Provinces Government will be greatly obliged if an early reply can be supplied to this reference as it is proposed, in the event of the tramway being sanctioned to start work thereon at a very early date.

C. J. IRWIN, I.C.S.,
Revenue Secretary to Government,
Central Provinces.

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(1) EPICORMIC BRANCHES IN *SAL.*

SIR,—In your April number Mr. Howard has recorded some interesting observations on epicormic branches on *sal.* I have not given the question special study, but so far as my experience goes epicormic branches are not common in the case of trees which have grown up under virgin forest conditions. They are however very general in jhumed areas. On such areas the crop ordinarily consists of unthinned overstocked pole forest individuals of which, when left exposed as standards, develop masses of epicormic branches. I consider however that had such crops been regularly thinned in the past it is probable that epicormic branches would have been the exception rather than the rule.

I personally consider that the system of coppice with standards for *sal* has little to recommend it save when necessitated by particular climatic factors such as frost. Apart from the development of epicormic branches and suppression of coppice shoots, it is found in this province that standards are liable to suffer from drought. This is probably due to the increased transpiration consequent on isolation. If standards must be kept in order to produce larger sized timber, then the best method is to keep them in groups of $\frac{1}{4}$ to $\frac{1}{2}$ an acre in size. If of course the coppice is grown on a very short rotation, it may prove advisable to keep isolated standards, but even in such a case smaller and more numerous groups of standards are likely to give satisfactory enough results from the point of view of seed production.

J. W. NICHOLSON, I.F.S.,
Provincial Research Officer,
Bihar and Orissa.

(2) EPICORMIC BRANCHES IN *SAL*.

SIR,—Reference the subject of epicormic branches in *sal* appearing in the April issue, I quite agree with the closing sentence of Mr. Howard's article. It is not the system but the silviculture which is to blame. Foresters who attempt regenerating *sal* areas by the system of coppice-with-standards in forests in which the average tree to be reserved as standard measures about 9" to 10" diameter, *i.e.*, about 2' to 2½' in girth (as stated to be the size of the tree exemplified in the article) are merely asking for trouble, and should consider themselves fortunate if the crop of epicormic branches is the only serious drawback resulting therefrom. Actually, there are many other vital objections to exploitation of forests of such tender age. I can adduce inexhaustible evidence to prove that when standards of the proper size, *i.e.*, more fully developed stems, are suddenly isolated, epicormic branches do not result. I am all in favour of coppice-with-standards for the simple reason that most *sal* forests are not yet ideally, suited for pure coppice and to change from high *sal* forest of the type so familiar to every local forester to pure coppice will spell (and what is more *has* spelled) disaster. Where is the conversion period? Where are the seedlings? What will result? ANSWER. *Taungya*. (ECHO. Never-ending trouble.)

As regards the causes of epicormic branches, stem or crown etiolation would certainly produce them

W. F. COOMBS, P.F.S.

KILN-SEASONING.

SIR,—In the February issue of the *Indian Forester* Mr. Stanley Fitzgerald pronounced in favour of hand—as against automatic control in connection with kiln-seasoning in this country. He does not, I think, mean to convey the impression that the automatic controls and elaborate fittings installed at Debra Dun are, therefore, superfluous. These extra fittings are not found on commercial drying kilns to any extent, even in America, for their object is to enable the research officer to

obtain and hold, with accuracy and ease, any drying conditions he wants. I think this point requires to be made clear and emphasised, for I know of one leading kiln-dryer of Indian timber who has been definitely put off by the complicated appearance of the Tiemann Research Kilns, and considers that the results obtained in them will not be of real commercial value.

Kiln-seasoning is a subject which seems to attract little general interest. I was specially struck by this fact when attending the Imperial Forestry Conference in Canada. The delegates spent little time looking at the kilns, and the only question I heard asked was "How long does it take?" On one occasion I tried to collect a little information and got left behind. However, I was lucky, for not only did I succeed in getting a lift in the Mill Manager's car, which enabled me to take part in the next excursion, but I also obtained one piece of information which the kiln-operator considered really valuable. He told me he always sent his lumber out in a *better* condition than he received it! Of course I raised no questions when I learnt what value he placed on his final steaming.

So, to encourage Mr. Fitzgerald in his good work of popularising his subject, may I ask him to explain a remark of his that has been puzzling me. (My only qualification for asking such a question is that I spent 6 months on Study Leave under Mr. Sweet)

Mr. Fitzgerald says that, when kiln-drying timber, the maximum temperature is reached at the same time as the fibre-saturation point, and is held till the end of the run. Mr. Sweet, if I remember rightly, not only reduced that humidity, but also increased the temperature, both more rapidly than before, once the fibre-saturation point was passed, the maximum temperature being reached towards the end of the run. I do not see what connection the maximum temperature has with the fibre-saturation point. Surely it must lead to more economical drying if the temperature be raised as much as it can be raised, without damaging the timber, once the critical point has been passed?

In this connection it would be interesting to know how Mr. Fitzgerald's results compare with those obtained by Mr. Teasdale

at Rangoon, and by Mr. Alexander Howard in London. A little over a year ago the latter very kindly let me spend a week at his kilns. He frankly admitted that his work was purely the result of long practical experience, and I do not think he placed much value on "scientific considerations," for the fibre-saturation point was not considered at all, and the test samples were not end-dipped. Mr. Howard found he was unable to use high temperatures at all. As a rule he began at 85° to 90° (F) and finished off at 105° to 115°. Mr. Sweet, on the other hand, started his *Sissoo* run at 115° and finished off at 160°, if I remember rightly. Mr. Howard told me that the cost of his drying worked out to a prohibitive figure, so much so that he was thinking of giving up his kilns as soon as his Wembley work was finished. Was this excessive cost due to his keeping his temperatures too low after the fibre-saturation point has been past? And was his inability to use high temperature due to a too rapid reduction of the humidity before the critical point had been reached? Mr. Howard, it should be stated, was handicapped in one respect. Trade conditions necessitated his drying different thicknesses in the same run, and he often had to interrupt runs to put in or take out urgently needed timber.

R. P. DALLEY, I.F.S.

REGENERATION FELLINGS IN THEORY AND PRACTICE.

SIR,—I have read Mr. Sen Gupta's note in the May issue of the "Indian Forester" with more attention than he seems to have accorded the article prompting his criticisms. Of the several issues raised by him the first and main one rests on a misconception both of what I wrote, and I venture to assert, of what he himself has heard and seen.

In my article I was most careful to make a distinction between "*Phillip's* Wedge" and Eberhard's "wedge idea" as I called it. Both I have fully described in their proper places. Mr. Sen Gupta, however, neither makes this distinction nor appears to believe in it. Indeed he (very loosely) reproduces my

description of Phillip's régime and saddles Eberhard with it, so that my remarks on the former are quoted as applying to the latter's. Although a very fine system of extraction lines exists at Langenbrānd, I cannot believe that Mr. Sen Gupta saw there such regularly spaced roads or even many "wedges"; and certainly the "well-defined temporary roads 90—100 yards wide" are a new and impressive feature since 1923. Perhaps others who have visited this forest in recent years will give us their impressions. I am tempted to think that Mr. Sen Gupta proceeded to Langenbrand with the determination of seeing only what his lecturer told him. He does not appear to quote Eberhard (who knows little English) and I may observe, without treading further on possibly delicate ground, that the originator's account of his own system is at least of equal interest.

Eberhard certainly evolved the "wedge." I have never denied it. The whole object of my article was, not to apportion credit for any new system or systems, but to demonstrate by actual instances the recent great change in German Silvicultural Practice. And Phillip's stereotyped version of the "Wedge" system was deliberately ranked among the "classic" systems in nice contrast to Eberhard's practice at Langenbrand. Mr. Sen Gupta has missed the chief point of my article. As I see it Phillip is, or was, something of a "diehard," a reactionary clinging to traditional policy, he moulded and modified a new idea (Eberhard's "wedge") in accordance with it and produced a "cut-and-dried" system, paying the usual penalty in the shape of heavy artificial regeneration costs. It is only fair to add that he was influenced by a special motive which shall be mentioned shortly.

Now Eberhard, on the other hand, *abandons the wedge-shaped formation wherever Nature regenerates his forest elsewhere.* He is too good a silviculturist to neglect the prolific seedling growth so often occurring at the foot of his slopes. And this led to modifications of his original conception which have been adequately described in my article.

This brings me to the second point, Mr. Sen Gupta contends that the "wedge" system was evolved with the idea of reducing windfall. (He does not say this; but it is obviously what he

means). I entirely disagree. The whole origin and development of the system indicates otherwise. The primary consideration was as I have previously stated—the reduction of damage caused by extraction. Why after all were "wedges" directed *down hill*? Why did these foresters elect to regenerate from above downwards when Nature generally preferred to begin at the bottom and work up? Why, in especial, did they adhere to this arrangement on East and Northernly aspects, on arrangement calculated whenever the dreaded South-westers blew, to create violent compression gusts and accentrate the very danger Mr. Sen Gupta supposes it designed to avoid? The "funnel" fellings on these aspects were introduced expressly to meet this danger. It is clear, then, that expeditious, undestructive extraction was considered more important than immunity from wind-blow. At Langenbrand, truly enough, there is now little wind-blow damage but Eberhard's special régime has departed far from the original "wedge" concept. I have already dealt with this. Phillip who adheres firmly to the "wedge" does not hope to reduce *windfall* to any extent but merely to minimize the dire effects of subsequent extraction. He suffers somewhat from "anemophobea," if I may use the term, due to his unfortunate experiences of storms and the havoc resulting from uncontrolled extraction. Even he abandoned his "wedge" and "funnels" on N. and E. slopes and now favours strip felling. But I cannot develop this interesting topic here.

With Mr. Sen Gupta's third contention I shall deal briefly. We are here, I suspect, concerned less with a question of fact than one of view point. He asserts that many of the "classic" systems besides Wagner's can be seen "working satisfactorily." Now, although I have by no means visited every forest in Germany and had in part to rely on authoritative statements, I should be more impressed with Mr. Sen Gupta's assertion without that qualifying phrase ". . . may be with some local modifications." I have discussed briefly a few "local modifications" which distinguish Phillip's system from Eberhard's and such as these are all important to my purpose. Throughout my article I have been concerned with tendencies and not with tables. It is not for me to define the word "system." But I contend that the word as

the Germans understood it in prewar days is no longer known. These very "local modifications" have robbed the systems of their "classic" features throughout the country and their significance is at least appreciated by the Germans themslves.

F. C. FORD ROBERTSON, I.F.S.

DOMESTIC OCCURRENCES.

BETROTHAL.

A marriage has been arranged to take place in July all Oxford between Harry George Champion, I.F.S., eldest son of Mr. and Mrs. Champion of Horsell, Surrey, and Chrystall Tempé, elder daughter of Mrs. Parsons and the late Lieut.-General Cunliffe McN. Parsons, C.B., Royal Marines.

GAZETTE NOTIFICATION.

1.—Gazette of India.

29th November 1924.—No. 783.—Consequent on the retirement of Mr G. K. Parker, Conservator of Forests, Burma, Mr. W. R. LeG. Jacob is confirmed as Conservator of Forests, Punjab, with effect from the 13th November 1924.

2.—Bengal Gazette.

21st October 1924.—No. 38-*For.*—On return from the leave granted to him in this Department Notification No. 33-For, dated the 28th August 1924, Babu Jnan Prasanna Roy, Extra Assistant Conservator of Forests, is posted to the charge of the South Borojhar Range, Buxa Division, with headquarters at Chilapata.

27th October 1924.—No. 39 *For.*—Babu Surendra Kumar Dutt, Extra Assistant Conservator of Forests, is transferred from the Sundarbans Division to the Buxa Division and placed on working plan duty with headquarters at Rajabhatkhawa.

18th November 1924.—No. 40 *For.*—Babu Jitendra Nath Sen Gupta, Probationary Extra Assistant Conservator of Forests, is transferred from the Jalpaiguri Division to the Buxa Division and placed on Working Plan duty with headquarters at Rajabhatkhawa, with effect from the 1st November 1924.

3.—Bihar and Orissa Gazette.

19th November 1924.—No. 17 Forests.—Maulavi Dilawar Husain Khan, Extra Assistant Conservator of Forests attached to the Saranda Forest Division, is transferred to the charge of the Kolhan Forest Division.

On relief by Maulavi Dilawar Husain Khan, Mr. E. R. Comber, Deputy Conservator of Forests in charge of the Kolhan Forest Division, is transferred to the charge of the Puri Forest Divlsion

On relief by Mr. Comber, Mr. O. A. Dodsworth, Extra Assistant Conservator of Forests in charge of the Puri Forest Division, remains attached to that Division with headquarters at Khurda.

This cancels Notification No. 16-Forests, dated the 30th September 1924.

No. 18-Forests.—Mr. P. W. Augier, Extra Assistant Couservator of Forests attached to the Puri Forest Division, is appointed to be Assistant Working Plan Officer with headquarters at Khurda, for the preparation of a Working Plan for the Banpur Mal Sal forests in the Puri Forest Division.

4.—Assam Gazette.

24th September 1924.—No. 2393-R.—Mr. J. S. Owden, Deputy Conservator of Forests, is granted combined leave for one year and two months, *viz.*, leave on average pay for eight months and leave on half average pay for six months, under rule 81 of the Fundamental Rules, with effect from the 9th August 1924.

29th October 1924.—No. 2636-R.—On return from leave, Babu Narendra Nath Das, Extra Assistant Conservator of Forests, is posted to the Lakhimpur Division as an attached officer.

8th November 1924.—No 2758-R.—On return from leave, Mr. A. J. W. Milroy, Deputy Conservator of Forests, is placed in charge of the Kamrup Forest Division.

No. 2761. R.—On being relieved by Mr. A. J. W. Milroy, Mr. N. L. Bor, Deputy Conservator of Forests, is attached to the Kamrup Forest Divisio .

5.—United Provinces Gazette.

8th November 1924.—No. 59.—Lala Girdhari Lal, Extra Assistant Conservator of Forests, attached to the Dehra Dun Forest Division in the Western Circle, is transfered to the Chakrata Forest Division in the same circle as an attached officer.

12th November 1924.—No. 60.—Lala Girdhari Lal, Extra Assistant Conservator of Forest, attached to the Chakrata Forest Division in the Western Circle, on relief, is retransferred to the Dehra Dun Forest Division in the same Circle as an attached officer.

No. 61.—Mr. E A. Smythies, Deputy Conservator of Forests, on return from leave, is posted to the charge of the Haldwani Forest Division in the Western circle.

13th November 1924.—No. 62.—Mr. M D. Chaturvedi, Assistant Conservator of Forests, attached to the Gorakhpur Forest Division in the Eastern circle, is posted to the charge of that Division

18th November 1924.—No. 63.—Twenty days' leave on average pay granted to Babu Chandra Mohan Johri, Extra Assistant Conservator of Forests, in Notification No. 34, dated the 13th September 1924 is extended by seven days.

19th November 1924.—No. 64.—Mr. Mathura Prasad Bhola, Deputy Conservator of Forests, on return from leave, is posted to the charge of the Gorakhpur Forest Division in the Eastern Circle.

No. 65.—Mr. Manohar Das Chaturvedi, Assistant Conservator of Forests in charge of the Gorakhpur Forest Division in the Eastern Circle, on being relieved, is re-posted to that Division as an attached officer.

6.—Punjab Gazette.

25th November 1924.—No. 26366.—Mr. R. M. Gorrie, Assistant Conservator of Forests, Northern Plantation Division (Western Circle) was transferred to the Rawalpindi West Forest Division as Divisional Forest Officer on 28th October 1924 (afternoon) relieving Khan Fazal Mohammad Khan, Assistant Conservator of Forests, transferred to Lahore Forest Division (Western Circle).

26th November 1924.—No. 26378.—Mr. L. B. Holland, Deputy Conservator of Forests, was on return from leave posted to the Northern Plantation Division (Western Circle) with headquarters at Lahore on the forenoon of the 22nd October 1924 relieving Mr. R. M. Gorrie, Assistant Conservator of Forests, transferred to the Rawalpindi West Forest Division. The unexpired portion of Mr Holland's leave is cancelled.

8th December 1924.—No. 19.—Mr. N. G. Pring, Deputy Conservator of Forests, attached to the Kangra Forest Division, is granted 28 days' leave on average pay under rule 81 of the Fundamental Rules, with effect from 26th November 1924 (F. N.).

7.—Central Provinces Gazette.

8th November 1924.—No. 4331-2200-III.—Under rule 81 (*b*) (*ii*) and 87 of the Fundamental Rules, leave on average pay for two months and nineteen days, combined with leave on half average pay, for a total period of six months, is granted to Mr. V. C. Bhagwat, Extra Assistant Conservator of Forests, Buldana Forest Division, with effect from the 15th December 1924, or any subsequent date on which he may be relieved of his duties.

No. 4332-2200-III.—Mr. E. L. P. Foster, Assistant Conservator of Forests, attached to the Buldana Forest Division, is appointed to hold charge of that Division, *vice* Mr. V. C. Bhagwat, proceeding on leave, or until further orders.

13th November 1924.—No. 4442-2227-III.—Mr. G. M. Willford, Extra Assistant Conservator of Forests, on leave, is permitted to return to duty and is posted to the charge of the North Mandla Division. The unexpired portion of the leave granted to him by Order No. 2268-1201-III, dated the 16th June 1924, is hereby cancelled.

No. 4443-2227-III.—On relief by Mr. Willford, Mr S. R. Davar, Extra Assistant Conservator of Forests, in charge of the North Mandla Division, is posted as attached officer to the South Mandla Division

20th November 1924.—No. 4635-2265-III.—Mr G B. Baksi, Assistant Conservator of Forests, attached to the office of the Conservator of Forests, Northern Circle, Jubblepore, is transferred to the Nimar Forest Division as an attached officer.

Order No. 3983-1877-III, dated the 22nd October 1924, is hereby cancelled.

8.—Madras Gazette.

31st October 1924.—Mr. B. K. Roy, Deputy Conservator of Forests, is granted extension of leave on average pay for one week in continuation of the six weeks' leave already granted to him

3rd November 1924.—*Posting.*—M R.Ry. V. N Seshagiri Rao, District Forest Officer, Lower Godavari, will, on relief by M.R.Ry. K. G Belliappa, be attached to the Lover Godavari Division.

No. 311.—Mr. A. A. F. Minchin, Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave for seven days.

No. 313.—The following posting of a Forest Officer is ordered :—

M.R.Ry. K G. Belliappa Avargal, Extra Assistant Conservator of Forests, on return from leave, to be District Officer, Lower Godavari.

4th November 1924.—No. 314.—Mr. T. Clear, Deputy Conservator of Forests, on return from leave, to act as Conservator of Forests, IV Circle, *vice* Mr. H. A. Latham granted leave.

No. 315.—Major W. F. Chipp, Forest Engineer, Sappal, to hold *full* charge of the duties of the Forest Engineer, Madras, in addition to his own, *vice* Capt. H. A. Irwin, granted leave.

13th November.—No. 321.—The following postings of Forest Officers are ordered :—

Mr. A. A. F. Minchin, Deputy Conservator of Forests, Coorg, on return from leave, to be District Forest Officer, Nilambur.

Mr D. F. Stileman, District Forest Officer, Nilambur, to be District Forest Officer, Palghat, on relief by Mr. Minchin,

Saiyid-ud-din Ahmad Sahib Bahadur, District Forest, Officer, Palghat, on relief by Mr. Stileman, to be District Forest Officer, East Kurnool.

17th November 1924.—No. 332.—Mr, R. D. Richmond, Conservator of Forests, is granted leave on average pay for eight months and on half average pay for four months with effect from or after 1st April 1925.

20th November 1924.—Muhammad Abdul Hafiz Sahib Bahadur, Extra Assistant Conservator of Forests, is granted an extension of leave on average pay for three days in continuation of the one month's leave aleady granted to him.

21st November 1924.—M.R Ry. B. A. Cariappa, Probationary Extra Assistant Conservator of Forests, is transferred from Ambasamudram to Olavakkode, with effect from 20th October 1924.

22nd November 1924.—No. 333.—Mr. T. Clear, Deputy Conservator of Forests, is granted an extension of leave on aveage pay for seven days in continuation of the leave already granted to him.

9.—Bombay Gazette.

10th/11th November 1924.—No. 4974.—Mr. V. N. Hasabmis, Extra Assistant Conservator of Forests, temporarily posted for special duty under the Divisional Forest Officer, Belgaum, for a period of three months from 18th July 1924, according to this Office Notification No. 2219 of 11th July 1924, resumed his duties in N. D. Kanara on the 6th November 1924 in the forenoon.

17th November 1924.—No. S. 20/10/19126.—Mr. J. L. Bell, Divisional Forest Officer, W. D. Kanara, is granted leave on averave pay for eight months, with effect from 1st April 1925 or the subsequent date on which he may be relieved

10.—BURMA GAZETTE.

30th October 1924.—No. 267.—On return from leave, Mr. A. Long, Extra Assistant Conservator of Forests, is reappointed Instructor (Minor), Burma Forest School, Pyinmana.

31st October 1924.—No. 268.—On relief by Mr. G. F. Mathews, Extra Assistant Conservator of Forests, Mr. J. M. Campbell, Extra Assistant Conservator of Forests and Revenue Assistant, North Pegu Forest Division, is transferred from Nyaunglebin and posted to duty in the Pyinmana Forest Division.

No. 269.—On return from leave, Mr. J. A. V. Welsh, Forest Engineer, is posted to duty in the Zigôn Forest Division, with headquarters at Tharrawaddy.

1st November 1924.—No. 280.—On return from leave, Mr. F. W. Collings, Conservator of Forests, is placed in charge of the Delta Forest Circle, in place of Mr. A. H. M. Barrington, Officiating Conservator of Forests, transferred.

No 281.—On relief by Mr. F. W. Collings, Conservator of Forests, Mr. A. H. M Barrington, Officiating Conservator of Forests, is placed in charge of the Tenasserim Forest Circle, in place of Mr. S. F. Hopwood, Officiating Conservator of Forests transferred.

No. 282.—On relief by Mr. A. H. M. Barrington, Officiating Conservator of Forests, Mr. S. F. Hopwood, Officiating Conservator of Forests, is transferred from Rangoon and placed in charge of the Chindwin Forest Circle, in place of Mr. H. C. Walker, Conservator of Forests, who remains in charge of the Northern Forest Circle.

3rd November 1924.—No. 283.—Mr. F. V. Webster, Extra Assistant Conservator of Forests, on probation, attached to the Meiktila Forest Division, is transferred from Meiktila and posted to duty in the Pyinmana Forest Division, with headquarters at Pyinmana.

4th November 1924.—No. 284.—Mr. J. A. V. Welsh, Forest Engineer, has been granted by the High Commissioner for India an extension of leave for four days in continuation of the leave granted to him in this Department Notification No. 94, dated the 8th April 1924.

5th November 1924.—No. 285.—Prior to his assumption of the charge of the South Tenasserim Forest Division to which he was posted in this Department Notification No. 262, dated the 29th October 1924, Mr. J. B. Mercer-Adam, Deputy Conservator of Forests, is attached to that Division.

12th November 1924.—No. 286.—Mr. G. K. Parker, Conservator of Forests, is permitted by His Majesty's Secretary of State for India, to resign the Indian Forest Service, with effect from the afternoon of the 12th November 1924.

14th November 1924.—No. 287.—Mr. R. W. V. Palmer, Deputy Conservator of Forests, in charge of the Pyinmana Forest Division, is appointed Sylviculturist, with affect from the 29th October 1924, in addition to his own duties, in place of Mr. C. R. Robbins, Assistant Conservator of Forests, transferred.

No 288.—On relief by Mr. R. W. V. Palmer, Deputy Conservator of Forests, Mr. C. R. Robbins, Assistant Conservator of Forests, is posted to duty in the Working Plans Circle, with headquarters at Tavoy.

No. 289.—On relief by Mr. W. S. Powell, Deputy Conservator of Forests, of the charge of the Pyinmana Forest Division, Mr. R. W. V. Palmer, Deputy Conservator of Forests, Sylviculturist, is placed on special duty at Mandalay in connection with the measurement of timber in the Mandalay Depôt Forest Division, as a temporary measure in addition to his own duties.

This Department Notification No. 266, dated the 30th October 1924, is cancelled.

20th November 1924.—No. 291.—Mr. C. B. Smales made over, and Mr. H. W. A. Watson received, charge of the office of Chief Conservator of Forests, Burma, on the 19th November 1924, afternoon.

26th November 1924.—No 293.—Prior to the assumption of the charge of the office of the Chief Conservator of Forests, Burma, to which he was posted in this Department Notification No 235, dated the 10th October 1924, Mr. H. W. A. Watson, Conservator of Forests, is placed on speeial duty in that office, with effect from the forenoon of the 10th November 1924

27th November 1924.—No. 295.—Mr. A H. M. Barrington. Officiating Conservator of Forests made over, and Mr. F. W. Collings, Conservator of Forests, received, charge of the Delta Circle on the 24th November 1924, beforenoon.

No. 296.—Mr S. F. Hopwood, Officiatiug Conservator of Forests, made over, and Mr. A. H. M. Barrington, Officiating Conservator of Forests received, charge of the Tenasserim Circle on the 24th November 1924, beforenoon.

No 297.—Mr. H. C. Walker, Conservator of Forests, made over and Mr. S. F. Hopwood, Officiating Conservator of Forests, received, charge of the Chindwin Circle on the 25th November 1924, beforenoon.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING THE MONTHS OF NOVEMBER-DECEMBER 1924.

The Indian Engineering, Vol. LXXVI, Nos. 20, 21 and 22, dated 15th, 22nd and 29th November 1924.

The Timber Trades Journal, Vol. XCVI, No. 2513, dated 25th October and No. 2514, dated 1st November 1924.

Tamarind as a source of alcohol and tartaric acid—Agricultural Research Institute, Pusa, Bulletin No. 153 of 1924.

Insolation, a factor in the natural regeneration of certain conifers—Yale University, School of Forestry, Bulletin No. 11.

Catalogue of India and Burma, Forestry and Timber Exhibits, British Empire Exhibition, Wembley, 1924. (Published by W. W. Howard Bros. and Co, London).

Quarterly Journal of Forestry, Vol. XVIII, No. 4, October 1924.

The Review of Applied Entomology, Series A: Agricuitural and Series B: Medical and Veterinary, Vol. XII, Part 10, October 1924.

Proceedings of the Legislative Council of the Governor of Madras, Second Session of the Second Legislative Council, Vol. XX, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, dated 10th, 11th, 13th, 14th, 15th 16th, 17th, 18th, 20th, 21st, 22nd and 23rd October 1924.

The Australian Forestry Journal, Vol. VII, No. 9, September 1924.

C. Leary and Co's London Market Reports, 1st to 31st October 1924.

International Review of the Science and Practice of Agriculture, New Series, Vol. II No. 3, July-September 1924.

Revue des Eaux et Forets, Vol. LXII, No. 10, October 1924.

Annual Report of the Committee of the Nilgiri Game Association for the year ending 30th June 1924.

Annual Report of the Director of Forestry of the Philippine Islands for the fiscal year ended 31st December 1923.

The Commercial Bulletin, November 1924.

Madagascar et Dependencies, Bulletin Economiqué, Annee 1924, No. 3, Partie: Statisques.

The Cyprus Agricultural Journal, Vol. XIX, Part 4, October 1924.

The "Mahali" Disease of Coconuts in Malabar—Memoirs of the Department of Agriculture in India, Botanicial Series, Vol. XIII, No 4, September 1924.

Timbers of Tropical America, by Samuel J. Record and Clayton D. Mell. (Yale University Press, New Haven).

Records of the Geological Survey of India, Vol. LVI, Part 2, 1924.

Allahabad:—Printed and published at the Pioneer Press, by C. G. HARRIS, No. 1829—1-1-'25.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

11th December 1924.—No. 843.—Mr. R. S. Hole, C.I.E., Forest Botanist, Forest Research Institute and College, Dehra Dun, who was placed on special duty in England from the 12th August 1923 to the 11th February 1924, is granted leave on average pay for 2 months and 20 days combined with leave on half average pay for 16 months and 4 days, with effect from the 12th February 1924.

No. 847.—Consequent on the grant of leave to Mr. C. B. Smales, Officiating Chief Conservator of Forests, Mr. H. W. A Watson, Conservator of Forests, is appointed to officiate as Chief Conservator of Forests, Burma, with effect from the afternoon of 19th November 1924.

29th December 1924.—No. 896.—Mr. M. C. Bonington, Deputy Conservator of Forests, North Andaman Forest Division, is posted to the charge of the South Andaman Forest Division, with effect from the forenoon of the 1st December 1924.

Mr. C. T. Trigg, Deputy Conservator of Forests, South Andaman Forest Division, is posted to the charge of the North Andaman Forest Division, with effect from the forenoon of the 1st December 1924.

2.—Bengal Gazette.

10th December 1924.—No. 10180 For.—Mr. R. A. M. Macalpine, Working Plan Officer, Jalpaiguri Division, is appointed to be Working Plan Officer, Buxa Division, with headquarters at Rajabhatkhawa with effect from the 2nd November 1924.

No. 10181 For.—Mr. C. K. Humfray, Assistant Conservator of Forests is transferred from the Jalpaiguri Division to the Buxa Division and placed on Working Plan duty with headquarters at Rajabhatkhawa, with effect from the 2nd November 1924.

3.—Bihar and Orissa Gazette.

Nil.

4.—Assam Gazette.

5th December 1924.—No. 3013R.—On return from leave, Mr. C. G. M. Mackarness, Deputy Conservator of Forests, is appointed to hold charge of the Sibsagar Forests Division.

No. 3014R.—On being relieved by Mr. C. G. M. Mackarness, Mr. W. Meiklejohn, Deputy Conservator of Forests, is transferred from the Sibsagar Forest Division and appointed to hold charge of the Goalpara Forest Division.

No. 3015R.—On being relieved by Mr. W. Meiklejohn, Mr. H. P. Smith, Deputy Conservator of Forests, is attached to the Goalpara Forest Division.

27th December 1924.—No. 3216R.—On return from leave, Mr. R. N. De, Extra Assistant Conservator of Forests, is attached to the Kamrup Forest Division.

No. 3217R.—Srijut Deveswar Barua, Extra Assistant Conservator of Forests, is transferred from Kamrup to the Lakhimpur Forest Division as an attached officer.

5.—United Provinces Gazette.

9th December 1924.—No. 66.—Mr. Jai Raj Singha, who has been appointed by the Secretary of State to be an Assistant Conservator of Forests is posted to the Kalagarh Forest Division in the Western Circle as an attached officer.

10th December 1924.—No. 67.—Mr. V. A. Herbert, Deputy Conservator of Forests, on reversion, is posted to the charge of the Ramnagar Forest Division in the Western Circle.

No. 68.—Thakur Bashi Ram, Extra Assistant Conservator of Forests, in charge of the Ramnagar Forest Division in the Western Circle, on relief, is posted to that Division as an attached officer.

23rd December 1924.—No. 1302/XIV-167.—The High Commissioner for India has granted Mian Muhammad Zia-ul-Haq, Extra Assistant Conservator of Forests, United Provinces, an extension of fourteen days' leave on average pay, with effect from the 7th February 1925.

No. 69.—Lala Suraj Bhan Bhatia, Extra Assistant Conservator of Forests, is granted leave on average pay for one month in extension of two months' leave on average pay granted to him in Notification No. 57, dated the 30th October 1924.

2nd January 1925.—No. 1.—Mr. Narendra Nath Sen, who has been appointed by the Secretary of State to be an Assistant Conservator of Forests, is posted to the Haldwani Forest Division in the Western Circle, as an attached officer.

5th January 1925.—No. 2.—Mr. F. K. Makins, Deputy Conservator of Forests, on return from leave, is posted to the charge of the Kalagarh Working Plan Division in the Working Plan Circle.

6.—Punjab Gazette.

10th December 1924.—No. 20.—Sardar Sohan Singh, Extra Assistant Conservator of Forests, attached to Kulu Forest Division (Eastern Circle), is granted 15 days' leave on average pay under Rule 81 of the Fundamental Rules, with effect from 20th November 1924 (afternoon).

No. 27709-*Forests*.—Mr. A. D. Blascheck, Conservator of Forests, Western Circle, Punjab, is granted leave for 11 months, namely, leave on average pay for 8 months (including 7 days' privilege leave) combined with leave on half average pay for 3 months, under rule 81 of the Fundamental Rules, with effect from the afternoon of the 20th November 1924.

No. 27712-*Forests*.—Mr B. O. Coventry Conservator of Forests, on return from leave, is placed in charge of the Western Circle, Punjab, relieving Mr. A. D. Blascheck, proceeding on leave, with effect from the afternoon of the 20th November 1924.

2. The unexpired portion of Mr. Coventry's leave is hereby cancelled.

No. 27699-*Forests*.—Khan Fazal Mohammad Khan, Assistant Conservator of Forests, was posted to the Lahore Division (Western Circle) with headquarters at Lahore on the afternoon of 5th November, 1924, relieving Mr. W. E. Flewett, Deputy Conservator of Forests, transferred to the Northern Plantation Division (Western Circle) as an attached officer with headquarters at Lahore.

15th December 1924.—No. 21.—Mr. E. Owen Williams. Forest Engineer, is attached to the Western Circle Office as in charge Tramway Unit at Changa Manga, with effect from 31st October 1924 (forenoon), on return from leave on average pay notified in this Department Notification No. 16, dated the 18th October 1924. The unexpired portion of leave, *viz.*, 2 days (31st October 1924 and 1st November 1924) is cancelled.

16th December 1924.—No. 23.—Sardar Sohan Singh, Extra Assistant Conservator of Forests is posted to the Kulu Forest Division as an attached officer with Headquarters at Kulu (Eastern Circle), with effect from 5th December 1924 (forenoon) on return from leave.

19th December 1924.—No. 28680-i. S.G.—Messrs. K. L. Aggarwal and D. D. Saigal, probationers of the Indian Forest Service, who reported their arrival at Bombay on the 5th December 1924, forenoon, are appointed Assistant Conservators of Forests and attached to the office of the Chief Conservator of Forests, Punjab, with effect from the 8th December 1924, forenoon.

No. 28676-*Forests.*—Mr. W. E. Flewett, Deputy Conservator of Forests, attached to the Northern Plantation Division (Western Circle) is placed in charge of the Division with effect from the 26th November 1924, forenoon relieving Mr. L. B. Holland, Deputy Conservator of Forests, transferred.

3rd January 1925.—No. 25.—Lala Ishwar Das, Extra Assistant Conservator of Forests, is posted to the office of the Chief Conservator of Forests, Punjab, as an attached officer with headquarters at Lahore, with effect from 25th December 1924 (afternoon) on return from leave.

14th January 1925.—No. 894-*Forests.*—On return from leave Mr. N. G. Pring, Deputy Conservator of Forests, is posted to the office of the Chief Conservator of Forests, Punjab, as an attached officer, with effect from the forenoon of the 23rd December 1924.

7.—Central Provinces Gazette.

27th November 1924.—No. 4800-2314-III.—Mr. Hopkins, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Service as probationer and allotted to the Central Provinces, is posted to the South Raipur Forest Division as attached officer.

No. 4801-2314-III.—Mr. Gentle, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Service as probationer and allotted to the Centeral Provinces, is posted to the Saugor Forest Division attached officer.

9th December 1924.—No. 4957-2313-III.—Mr. H. C. Watts, Deputy Conservator of Forests, Central Provinces, was attached to the South Raipur Forest Division from the 2nd to the 5th November 1924, both days inclusive.

No. 4958-2313-III.—On relief by Mr. H. C. Watts, Deputy Conservator of Forests, Mr. Dhanraj Dutt, Extra Assistant Conservator of Forests, is posted to the South Raipur Forest Division as attached officer in sole charge of the Mixed Forests Working-Plan.

Order No. 4236-1897-III, dated the 4th November 1924, is hereby cancelled.

5th January 1925.—No. 28-32-III.—Mr. Vishnu Prasad Mathur, Extra Assistant Conservator of Forests, attached to the Bhandara Division, is transferred to the Akot Sub-Division of the Melghat Forest Division as Sub-Divisional Officer, *vice* Mr. Salekhuram, reverted as Ranger.

7th January 1925.—No. 62-2298-III.—Mr. K. F. R. Dickins, Deputy Conservator of Forests, attached to the South Chanda Forest Division, is appointed to hold charge of that Division, with effect from the 20th November 1924 (afternoon).

No. 63-2298-III.—On relief by Mr. Dickins, Mr. H. S. George, Deputy Conservator of Forests, in charge of the South Chanda Forest Division, is appointed to be Personal Assistant to the Conservator of Forests, Southern Circle.

8.—Madras Gazette.

6th December 1924.—Saiyid-ud-din Ahmed Sahib Bahadur, District Forest Officer, Palghat, is, on relief by Mr. D. F. Stileman, granted leave on average pay up to 23rd December 1924 (inclusive), with permission to affix the Christmas and New Year holidays to the leave, provided the conditions laid down in the Subsidiary Rules under Fundamental Rule 68 are fulfilled

7th December 1924.—M.R.Ry. M. H. Krishnaswami, Extra Assistant Conservator of Forests, Ambasamudram, is granted leave on average pay for sixteen days, with effect from 8th December 1924, with permission to affix the Christmas and New Year holidays.

8th December 1924.—The following postings of the Imperial Forest Service Probationers are ordered :—

1. Mr. J. Coode ... ... Under the Chief Forest Engineer.
2. ,, V. S. Kuppuswami Ayyar ,, Conservator, II Circle, Bellary.
3. ,, B. Janakiram Singh ... ,, District Forest Officer, Tinnevelly.
4. ,, Tara Singh ... ... ,, Do. North Coimbatore.

13th December 1924.—No. 346.—Mr. F. D. Ardagh, Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave for fourteen days.

15th December 1924.—Mr. S. R. Rao, Assistant Conservator of Forests, Guntur, is granted leave on average pay for seven days from 3rd January 1925, with permission to prefix the Christmas and New Year holidays provided the conditions laid down in the Subsidiary Rules under Fundamental Rule 68 are fulfilled.

M R Ry. K. A. Chengappa Avargal, District Forest Officer, Nellore, is granted leave on average pay for two months from or after 6th January 1925.

Muhammad Abdul Hafiz Sahib Bahadur, Extra Assistant Conservator of Forests, is, on relief by Saiyid un-din Ahmed Sahib Bahadur, posted to be in charge of the Nellore Division during the absence of M.R.Ry. K A. Chengappa Avargal, on leave.

The notification, dated 6th December 1924, granting leave to Saiyid-ud-din Ahmed Sahib Bahadur, District Forest Officer, Palghat, is cancelled.

17th December 1924.—Mr. K. T. Matthew, Assistant Conservator of Forests, is transferred from Sappal to Karkal in the North Mangalore Division, with effect from 18th November 1924.

9.—Bombay Gazette.

12th December 1924.—No. S.-20/10/20298.—Mr. E. M Hodgson, Conservator of Forests, Central Circle, is granted, with effect from 1st March 1925 or from the date of relief, leave on average pay for five months and on half average pay for two months.

19th December 1924.—No. S.-20/10/20726.—The Governor with the concurrence of the Minister is pleased to make the following appointments :—

Mr. W. A. H. Miller, Divisional Forest Officer, Poona, to be Divisional Forest Officer, West Khandesh.

Mr. R. A. Shirali, Divisional Forest Officer, West Khandesh, on relief, to be Divisional Forest Officer, Poona.

10.—Burma Gazette.

2nd December 1924.—No. 302.—On completion of the special duty to which he was posted in this Department Notification No. 260, dated the 29th October 1924, Mr. A. R. Villar, Deputy Conservator of Forests, is transferred from Mandalay and reposted to the charge of the South Pegu Forest Division.

No 303.—On relief by Mr A. R. Villar, Deputy Conservator of Forests, Mr. W. C. Rooke, Extra Assistant Conservator of Forests, is transferred from Pegu and posted to the charge of the Minbu Forest Division, in place of Mr. R. L. Pocock, Deputy Conservator of Forests, proceeding on leave.

4th December 1924.—No. 305.—Mr. E. C. Simmons, Assistant Conservator of Forests, attached to the Tharrawaddy Forest Division, was transferred from Tharrawaddy and is attached to the Working Plan Circle, Maymyo, with effect from the forenoon of the 22nd October 1924.

7th December 1924.—No. 306.—Mr. R. McCraken, Extra Assistant Conservator of Forests, is transferred from the Shwegyin Forest Division and posted to duty in the Pyinmana Forest Division as Revenue Assistant in place of Mr. E. H. Peacock, Extra Assistant Conservator of Forests, transferred.

No. 307.—On relief by Mr R. McCraken, Extra Assistant Conservator of Forests, Mr. E H Peacock, Extra Assistant Conservator of Forests and Revenue Assistant, Pyinmana Forest Division, is transferred from Pyinmana and posted to the charge of the Upper Chindwin Forest Division in place of Mr. C. S. Baldwin, Extra Assistant Conservator of Forests transferred to the Andamans.

No. 308.—On return from leave, Mr. W. S Shepherd, Deputy Conservator of Forests, is posted to duty in the Working Plans Circle, with headquarters at Moulmein.

No. 309.—On completion of the special duty to which he was posted in this Department Notification No. 164, dated the 4th July 1924, Mr. E Q O'Brien-Smith, Assistant Conservator of Forests, is transferred from Toungoo and posted to duty in the Katha Forest Division

8th December 1924.—No. 310.—The services of Mr. G. C. Cheyne, Deputy Conservator of Forests, are placed at the disposal of the Public Works Department, Irrigation Branch, Burma, with effect from the date on which he returns from leave.

9th December 1924.—No. 311.—Under the provisions of Rules 80 and 81 (*b*) of the Fundamental Rules, an extension of leave on average pay for fifteen days is granted to Mr R. J. Sayres, Assistant Conservator of Forests, in continuation of the leave granted to him in this Department Notification No. 257, dated the 28th October 1924.

No. 312.—Mr. J. D. Hamilton, Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave on medical certificate for three months in continuation of the leave granted to him in this Department Notification No. 234, dated the 8th October 1924.

10th December 1924.—No 313.—On completion of the special duty to which he was posted in this Department Notification No 240, dated the 16th October 1924, Mr. W. H. Osborne, Assistant Conservator of Forests, is transferred from Mandalay and posted to duty in the Pyinmana Forest Division.

19th December 1924.—No. 315.—Mr. G. D. Warwick, Assistant Conservator of Forests, is transferred from the Zigôn Forest Division, and attached to the Myitmaka Extraction Forest Division.

23rd December 1924.—No. 316.—Mr. F. C. Purkis, Deputy Conservator of Forests, is permitted to return to duty before the expiry of the leave granted to him in this Department Notification No. 83, dated the 28th March 1924, and posted to the charge of the South Arakan Forest Division, in place of Mr. C. Alfred, Extra Assistant Conservator of Forests, transferred.

No. 317.—On relief by Mr. F. C. Purkis, Deputy Conservator of Forests, Mr. C. Alfred, Extra Assistant Conservator of Forests, is transferred from the South Arakan Forest Division and posted to duty in the North Toungoo Forest Division as Revenue Assistant, in place of Mr. C. L. Edwards, Extra Assistant Conservator of Forests, transferred.

No 318.—On relief by Mr. C. Alfred, Extra Assistant Conservator of Forests, Mr. C. L Edwards, Extra Assistant Conservator of Forests and Revenue Assistant, North Toungoo Forest Division, is transferred from Toungoo and posted to duty in the Myittha Forest Division.

No. 319.—Mr. E. A. D'Silva, Extra Assistant Conservator of Forests, is transferred from the North Toungoo Forest Division and attached to the Thayetmyo Forest Division with headquarters at Prome

No. 320.—Mr. Taw Kyi Saing, Extra Assistant Conservator of Forests, is transferred from the South Toungoo Forest Division, and attached to the Shwegyin Forest Division, in place of Mr. R. McCraken, Extra Assistant Conservator of Forests, transferred.

No 321.—Under the provisions of Rules 80 and 81(*b*)(*i*) of the Fundamental Rules, leave on average pay for eight months and in continuation thereof leave on half

average pay for ten months, for a total period of one year and six months, is granted to Mr. E. F. A. Hay, Deputy Conservator of Forests, in charge of the Tharrawaddy Forest Division with effect from the 16th December 1924.

No. 322.—Mr. E A. Sitzler, Deputy Conservator of Forests, in charge of the Zigôn Forest Division, is placed in charge of the Tharrawaddy Forest Division, as a temporary measure, in addition to his own duties, in place of Mr. E. F A Hay, Deputy Conservator of Forests, proceeding on leave.

No. 323.—On return from leave Mr. E. W. Carroll, Deputy Conservator of Forests, is posted to the charge of the Tharrawaddy Forest Division in place of Mr. E. A. Sitzler, Deputy Conservator of Forests, who remains in charge of the Zigôn Forest Division.

No 324.—On return from leave Mr. A. W Moodie, Deputy Conservator of Forests, is posted to the charge of the Depôt and Agency Forest Division, in place of Mr D. W. Hughes, Deputy Conservator of Forests, who remains attached to the Division.

No. 325.—Mr. H. Hilbert, Extra Assistan' Conservator of Forests, is transferred from the Depôt and Agency Forest Division and posted as Revenue Assistant in the Delta Forest Division with headquarters at Mawlamyainggyun in place of U Thet She, Extra Assistant Conservator of Forests, transferred.

No. 326.—On relief by Mr. H Hilbert, Extra Assistant Conservator of Forests, U Thet She, Extra Assistant Conservator of Forests, and Revenue Assistant, Delta Forest Division, is transferred from Mawlamyainggyun and posted to the charge of the Allanmyo Forest Division, in place of U Kyaw, Deputy Conservator of Forests, transferred.

No. 327.—On relief by U Thet She, Extra Assistant Conservator of Forests, U Kyaw, Deputy Conservator of Forests, in charge of the Allanmyo Forest Division, is transferred from Thayetmyo and posted to the charge of the Mandalay Depôt Forest Division, in place of U Tha Myaing, Deputy Conservator of Forests, proceeding on leave.

29th December 1924.—No. 329.—Mr. C H Thompson, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the Working Plans Circle, with headquarters at Magwe.

Mr. Thompson reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 330.—Mr. J. H. Digges la Touche, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the Working Plans Circle, with headquarters at Moulmein.

Mr. la Touche reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 331.—Mr. J. O. Wadhams, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the headquarters of the Pyinmana Forest Division of the Central Circle.

Mr. Wadhams reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 332.—Mr. F. J Mustill, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the headquarters of the Myitmaka Extraction Forest Division of the Utilisation Circle.

Mr. Mustill reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 333.—Mr. C. W. Kermode, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the Working Plans Circle, with headquarters at Shwebo.

Mr. Kermode reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 334.—Mr. M. N. Gallant, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the headquarters of the Katha Forest Division of the Northern Circle.

Mr. Gallant reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 335.—Mr. J. A. Clarke, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the Working Plans Circle, with headquarters at Shwebo.

Mr. Clarke reported his arrival in Rangoon on the 27th December 1924, before noon.

No. 336.—Mr. L. E. Smith, who has been appointed by His Majesty's Secretary of State for India to the Indian Forest Service as Assistant Conservator of Forests, is posted on arrival to the headquarters of the South Pegu Forest Division of the Sittang Circle.

Mr. Smith reported his arrival in Rangoon on the 27th December 1924, before noon.

LIST ON BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING THE MONTHS OF DECEMBER 1924-JANUARY 1925.

The Indian Engineering, Vol. LXXVI, Nos. 24, 25 and 26, dated 13th, 20th and 27th December 1924 and Vol LXXVII, Nos 1 and 2, dated 3rd and 10th January 1925.

The Timber Trades Journal, Vol. XCVI, Nos 2517, 2518, 2519, 2520 and 2521, dated 22nd and 29th November and 6th, 13th and 20th December 1924.

Quinquennial Review of Forest Administration in the Province of Assam for the years 1919-20 to 1923-24 with Progress Report of Forest Administration for 1923-24.

Revue des Eaux et Forets, Vol. LXII, Nos 11 and 12 for November and December 1924.

The Scottish Geographical Magazine, Vol. XL, No. 6, 15th November 1924.

Proceedings of the Legislative Council of the Governor of Madras, Second Session of the Second Legislative Council, Vol. XXI, Nos. 1, 2, 3, 4, 5, 6 and 7, dated 12th, 13th 14th, 17th and 18th November and 3rd December 1924.

The Agricultural Journal of India, Vol. XIX, Part VI, November 1924.

The Review of Applied Entomology, Series A: Agricultural and Series B: Medical and Veterinary, Vol. 12, Part 11, November 1924.

Experiment Station Record, Vol. 51, Nos. 4 and 5 for September and October 1924, and No. 6, Abstract Number, issued November 1924.

C. Leary & Co.'s London Market Reports, 1st to 30th November 1924.

Elements of Forestry, by F. Moon and N. C. Brown.

The Australian Forestry Journal, Vol. VII, No. 10, October 1924 and No. 11, November 1924.

Report on the Forest Administration in the Federated Shan States for the year ended 31st March 1924.

Classified List of Officers of the Imperial and Provincial Forest Services and of Forest Engineering Service in India and Burma on the 1st July 1924.

Report of the College of Agriculture and the Agricultural Experiment Station of the University of California, 1st July 1922 to 30th June 1924.

Industrial India, Vol. III, No. 12, July 1924.

India's Forest Wealth, by E A. Smythies.

Home Canning University of California, Agricultural Experiment Station, Berkeley, California, Circular No. 276, March 1924.

Studies on a Nutritional Disease of Poultry caused by Vitamin deficiency, University of California, Agricultural Experiment Station, Berkeley, California, Bulletin No. 378, May 1924.

The Seasoning and Preservation of Timber, by Ernest G. Blake.

The Madras Forest College Magazine, Vol. IX, No. 2, December 1924.

Report of Forest Administration in the Andamans for the year 1922-23.

Report of Forestry Commission of New South Wales for the year ended 30th June 1924.

Annual Report of the Forest Department of the Colony of British Honduras for the year ending 31st March 1924

Annual Progress Report on Forest Administration in the United Provinces from 1st April 1923 to 31st March 1924.

Journal of Forestry, Vol. XXII, No. 8, December 1924.

The Tropical Agriculturist, Vol. LXIII, No 6, December 1924.

Transactions of the Royal Scottish Arboricultural Society, Vol. XXXVIII, Part II October 1924.

Report on the Administration of Cochin for the year 1099 M.E., 17th August 1923 to 15th August 1924.

Allahabad:—Printed and published at the Pioneer Press, by C. G. HARRIS,
No. 2030—1-2-25.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

16th April 1925.—No. 307.—Mr. H. L. Cooper, Officiating Conservator of Forests in the United Provinces, reverted to his substantive appointment of Deputy Conservator of Forests in Assam, with effect from the forenoon of 31st March 1925.

2.—Bengal Gazette.

Nil.

3.—Bihar and Orissa Gazette.

14th April 1925.—No. 4-Forests.—Mr. M. L. Sen Gupta, Assistant Conservator of Forests, attached to the Saranda Forest Division, is granted leave for one month and twenty-three days from the 1st March 1925, *viz.*, leave on average pay for twenty-three days and leave on average pay on medical certificate for the remaining period, under Fundamental Rules 77 and 81.

4.—Assam Gazette.

1st April 1925.—No. 748R.—Mr. A. R. Thomas, Deputy Conservator of Forests, is granted leave on average pay for eight months, under rule 81 of the Fundamental Rules, with effect from the afternoon of the 9th March 1925.

No. 749R.—Babu Chandra Sekhar Purkayastha, Extra Assistant Conservator of Forests, was temporarily appointed to hold charge of the Garo Hills Forest Division, with effect from the afternoon of the 9th March 1925.

No. 750R.—Mr. N. L. Bor, Deputy Conservator of Forests, is appointed to hold charge of the Garo Hills Forest Division, with effect from the afternoon of the 18th March 1925.

6th April 1925.—No. 767R.—Mr. J. S. Owden, I.F.S., Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave as advised in the list dated the 12th March 1925 for eleven days on half average pay from 9th October 1925.

25th April 1925.—No. 939R.—Mr. J. S. Owden, I.F.S., Deputy Conservaror of Forests, has been granted by the High Commissioner for India a further extension of leave as advised in the list dated the 2nd April 1925 for two days on half average pay from 20th October 1925.

27th April 1925.—No. 947R.—On reversion to Assam, Mr. H. L. Cooper, Deputy Conservator of Forests, is appointed to hold charge of the Goalpara Forest Division.

No. 948R.—On being relieved by Mr. H. L. Cooper, Mr. W. Meiklejohn, Deputy Conservator of Forests, is attached to the Goalpara Forest Division.

5.—United Provinces Gazette.

14th April 1925.—No. 16.—Mr. Shah Nawaz Khan, Extra Assistant Conservator of Forests, attached to the Bahraich Forest Division in the Eastern Circle, is transferred to the Afforestation Division in the Working Plans Circle as an attached officer.

21st April 1925.—No. 17.—Babu Sohan Singh Negi, on appointment as Extra Assistant Conservator of Forests, is posted to the Chakrata Forest Division in the Western Circle as an attached officer.

No. 18.—Mr. Herbert Dudt, on appointment as Extra Assistant Conservator of Forests, is posted to the Bahraich Forest Division in the Eastern Circle as an attached officer.

6.—Punjab Gazette.

17th April 1925.—No. 10280.—Khan Sahib Allah Bakhsh, Deputy Conservator of Forests, attached to the Hoshiarpur Forest Division (Eastern Circle), is transferred and attached to the Northern Plantation Division (Western Circle), with headquarters at Changa Manga, with effect from the forenoon of the 16th March 1925.

18th April 1925.—No. 10397.—Mr. E. Owen Williams, Forest Engineer, attached to the office of the Conservator of Forests, Western Circle, Punjab, proceeded on seven months' leave on average pay under Rule 81 of the Fundamental Rules, with effect from the afternoon of the 18th March 1925.

No. 10416.—Mr. L. B. Holland, Deputy Conservator of Forests, attached to the office of the Chief Conservator of Forests, Punjab, is transferred to Hazara, North-West Frontier Province, with effect from the forenoon of the 1st April 1925.

20th April 1925.—No. 3.—Lala Ram Chandra, Extra Assistant Conservator of Forests, attached to the Northern Plantation Division (Western Circle), is transferred and attached to the Hoshiarpur Forest Division with Headquarters at Kinoo, with effect from the forenoon of the 28th March 1925.

28th April 1925.—No. 11092.—The following appointments are made with effect from the date noted :—

Name.	Appointment.	Division to which posted.	With effect from	Remarks.
1. Sant Ram ...	Probationary Extra Assistant Conservators of Forests.	Rawalpindi West	1st April 1925.	After passing the Provincial Service course of the Imperial Forest College, Dehra Dun.
2. Jalmeja Singh		Simla ...		
3. Jaswant Singh		Kulu ...		
4. Ram Saran ...		Simla ...		
5. Manohar Lal...		Lower Bashahr		
6. Hari Singh ...		Ditto ...		
7. Muhammad Akram.		Rawalpindi West		
8. Ram Chand...		Northern Plantation.		

No. 4.—Mr. Pirthi Nath Deogan, Probationary Extra Assistant Conservator of Forests, attached to the Northern Plantation Division, is transferred and attached to the Upper Bashahr Forest Division, with headquarters at Kilba, with effect from the forenoon of the 7th April 1925.

7.—Central Provinces Gazette.

27th March 1925.—No. 25.—Leave on average pay for four months, under Fundamental Rule 81 (*b*) (*ii*), is granted to Mr. S. R. Dawar, temporary Extra Assistant Conservator of Forests, attached to the South Mandla Forest Division, with effect from the 10th April 1925.

14th April 1925.—No. 1696-728-III.—Under Rules 81 (*b*)(*i*) and 81(*c*) of the Fundamental Rules, leave on average pay for one month and ten days, combined with leave on half average pay "not due" for two months and twenty days, is granted to

Mr. Syed Abdul Wahid, Assistant Conservator of Forests, in extension of the leave already granted to him by Order No. 4143-2136-III, dated the 1st November 1924.

8.—Madras Gazette.

8th April 1925.—No. 114.—Mr. O. H. C. Shelswell, Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave for six months on medical certificate.

15th April 1925 —Mr. H. W. A. Gaudoin, District Forest Officer, South Vellore, is granted leave on average pay for one month from or after 1st May 1925.

20th April 1925.—M.R.Ry. V. N Seshagiri Rao, Extra Assistant Conservator of Forests, Lower Godavari Division, is granted leave on average pay for five days from 15th April 1925.

21st April 1925 —M.R.Ry. A. Hanumantha Rao, Extra Assistant Conservator of Forests, South Vellore Division, is posted to act as District Forest Officer, South Vellore, during Mr. H. W. A. Gaudoins' absence on leave.

23rd April 1925 —Mr K. T Matthew, Assistant Conservator of Forests, attached to the Logging Engineer, is transferred from Karkal in the North Mangalore Division to Tinnevelly with effect from 31st January 1925.

26th April 1925 —M.R.Ry. S. Ramaswami Ayyar, Extra Assistant Conservator of Forests, is granted leave on average pay on medical certificate for six months, with effect from 19th February 1925.

27th April 1925 —The leave for one and a half months granted to M.R.Ry. V. Narayana Ayyar Avargal, Extra Assistant Conservator of Forests, Fourth Circle, in Chief Conservator's Proceedings L. Dis. No. 1119/25, dated 2nd March 1925, and notified at page 458 of Part II of the Fort St. George Gazette, dated 10th March 1925, is cancelled.

28th April 1925.—Saiyid Riazuddin Sahib Bahadur, Extra Assistant Conservator of Forests, South Cuddapah Division, is transferred to West Cuddapah Division, to hold charge of the Sanipaya range as a temporary measure.

9.—Bombay Gazette.

14th April 1925.—No. S. 20/10/5548.—The Governor, with the concurrence of the Minister, is pleased to appoint Mr. R. W. Inder, Divisional Forest Officer, West Nasik, to be Forest Settlement Officer of the Point Taluka from the date of taking over charge.

No. S. 20/10/6709.—The Governor, with the concurrence of the Minister, is pleased to appoint Mr. H. J. C. Millett, Assistant Conservator of Forests, Kanara Northern Division, to act as Divisional Forest Officer, Kanara Western Division, vice Mr. J. L. Bell, on leave.

10.—Burma Gazette.

2nd April 1925.—No 56.—Under the provisions of Rules 80 and 81 of the Fundamental Rules, leave on average pay for three months is granted to Mr. W. A. Robertson, Officiating Conservator of Forests, Utilization Circle, with effect from the 7th April 1925 or the subsequent date on which he may avail himself of it.

No. 57 —Mr. D. P. Hewett, Officiating Conservator of Forests, Hlaing Circle, is placed in charge of the Utilization Circle, in addition to his own duties, as a temporary measure, in place of Mr. W. A. Robertson, Officiating Conservator of Forests, proceeding on leave.

7th April 1925.—No. 59.—Having satisfactorily completed the course of training at the Forest Research Institute and College, Dehra Dun, to which they were deputed by this Government, the following are appointed to be Extra Assistant Conservators of Forests, on probation, on Rs 300 per mensem, with effect from the 31st March 1925, and are posted to duty in the Forest Divisions noted against their names :—

(1) U. Kyaw Din, North Toungoo Forest Division.

(2) Mr. J. P. Cook, Tharrawaddy Forest Division.

(3) Mr. M. J. Rosair, Tharrawaddy Forest Division.

6th April 1925.—No. 60.—On return from leave, Mr A. P. Davis, Deputy Conservator of Forests, is posted to the charge of the Katha Forest Division in place of Mr. J. M. D. Mackenzie, Deputy Conservator of Forests, transferred.

16th April 1925.—No. 64.—Under the provisions of the Rules contained in Financial Department Notification No. 57, dated 31st December 1921, as amended by the same Department Notification No 7, dated the 2nd February 1923, leave on average pay for two months and ten days is granted to Mr R. S. H. Collins, Junior Timber Assistant (Temporary), Myitmaka Extraction Division, with effect from the forenoon of the 23rd February 1925.

Mr. R. S. H. Collins' services will terminate on the expiry of this leave.

No. 65.—On relief by Mr. A. P. Davis, Deputy Conservator of Forests, Mr. J. M. D. Mackenzie, Deputy Conservator of Forests, in charge of the Katha Forest Division, is transferred from Katha and posted to duty in the Working Plans Circle, with headquarters at Maymyo.

No 66.—The following candidates, who have obtained a decree in Forestry in the University of Rangoon, are appointed to be Extra Assistant Conservators of Forests, on probation, on Rs. 300 per mensem, with effect from the 4th April 1925 and posted to duty in the Forest Divisions noted against their names:—

(1) U Mya, Prome Forest Division.

(2) U Po Mu, Insein Forest Division.

(3) Mr. Tin Wain, Thatôn Forest Division.

(4) U Ba Chit, Ataran Forest Division.

(5) U Ohn, South Toungoo Forest Division.

(6) Mr. H. L. Walden, Katha Forest Division.

No. 67.—Mr. S. Newland, who obtained a diploma in Forestry in the University of Edinburgh, is appointed to be an Extra Assistant Conservator of Forests, on probation, on Rs. 300 per mensem, with effect from the 4th April 1925 and posted to the Myitmaka Extraction Forest Division.

18th April 1925.—No. 68.—Under the provisions of Rules 80 and 81 of the Fundamental Rules and with reference to Resolution No F. 20 (2) C.S.R., dated the 4th February 1925, of the Government of India in the Finance Department, leave on average pay for eight months and in continuation thereof leave on half average pay for three months, for a total period of eleven months, and study leave from the middle of February 1926 till September 1926, is granted to Mr. A. J. S. Butterwick, Extra Assistant Conservator of Forests, in charge of the Bhamo Forest Division, with effect from the 28th April 1925 or the subsequent date on which he may avail himself of the leave.

Mr. Butterwick proceeds to England.

20th April 1925.—No. 69.—Mr. W. A. Robertson, Officiating Conservator of Forests, made over, and Mr. D. P. Hewett, Officiating Conservator of Forests, Hlaing Circle, received charge of the Utilization Circle, in addition to his own duties, as a temporary measure, on the 9th April 1925, afternoon.

21st April 1925.—No. 70.—Mr. C. W. Scott, Deputy Conservator of Forests, on duty in the Working Plans Circle, is transferred from Tavoy and is reappointed Director of the Burma Forest School in place of Mr. A. H Lloyd, Deputy Conservator of Forests, who remains as Instructor (Major) of the School

22nd April 1925.—No. 71.—Mr. D. A. Allan, Deputy Conservator of Forests, attached to the Utilization Forest Circle, is transferred from Rangoon and posted to the charge of the Bhamo Forest Division, in place of Mr. A. J. S. Butterwick, Extra Assistant Conservator of Forests, proceeding on leave.

23rd April 1925.—No. 72.—Under the provisions of Rules 80 and 81 of the Fundamental Rules, an extension of leave on half average pay for one month is granted to Mr. J. D. Hamilton, Deputy Conservator of Forests, in continuation of the leave granted to him in this Department Notification No. 312, dated the 9th December 1924.

No. 73.—Mr. A. H. M. Barrington, Officiating Conservator of Forests, made over, and Mr. J. L. Baker, Conservator of Forests, Sittang Circle, received charge of the Tenasserim Circle, in addition to his own duties, as a temporary measure, on the 21st April 1925, afternoon.

No. 74.—Mr. R. Udwin, Deputy Conservator of Forests, has been granted by the High Commissioner for India an extension of leave on half average pay for fifteen days in continuation of the leave granted to him in this Department Notification No. 201, dated the 22nd August 1924, as amended by Notification No. 214, dated the 11th September 1924.

27th April 1925.—No. 75.—Mr. H. E. Flint, Deputy Conservator of Forests, on duty in the Working Plans Circle, is transferred from Maymyo and posted to the charge of the Mogôk Forest Division in place of Mr. W. T. T. McHarg, Deputy Conservator of Forests, proceeding on leave.

No. 76.—Mr. L. R. Fletcher, Forest Engineer, attached to the Ataran Forest Division, is transferred from Moulmein and posted to duty in the Tharrawaddy Forest Division, with headquarters at Tharrawaddy.

NOTICES.

1. Attention is drawn to the list of Forest Publications at the end of this issue, as it is thought they might prove of interest to those engaged in Indian Wood Industries.

2. Chidri Abdul Rahman Ismail Saheb, 95, Thumboo Chetty Street, G. T., Madras, would be glad to receive Sambhar horns for sale at a discount of 3 per cent. only.

3. Mr. John W. Roberts, Billiard Expert, 5, Ferozepur Road, Lahore, wishes to be put in touch with suppliers of Tendu (*Diospyros Melanoxylon*). Will Divisional Forest Officers and others having supplies kindly write direct to Mr. Roberts.

4. The Deputy Administrative Officer, Forest Department, Gwalior State, has a large quantity of Buck and Sambhar horns for disposal. Purchasers should apply direct to him for further particulars.

5. The Divisional Forest Officer, Yeotmal Division, Yeotmal, has a large quantity of Sambhar and Chital horns for disposal. Purchasers should apply direct to him for further particulars.

INDIAN TRADE ENQUIRIES.

The following Trade Enquiries have been received by the Director-General of Commercial Intelligence, 1, Council House Street, Calcutta, who will welcome replies to be addressed to him direct by any individual or firm interested.

GURJAN, PADAUK, ETC.

(N-198) A firm in Calcutta desires to be put in touch with purchasers of Gurjan, padauk and miscellaneous packing timbers in Madras and Bombay Presidencies.

KAPOC SEED.

(N-199) A local firm enquires for purchasers with suppliers of kapoc seed.

NEPAL SAL.

(N-204) A local firm enquires for purchasers of round Nepal Sal logs.

PODOPHYLLUM ROOTS.

(N-206) A firm in Rawalpindi, Punjab, desires to be put in touch with purchasers of drugs such as roots of Podophyllum, Belladonna and Marsh-mallow.

SAL SLEEPERS.

(N-212) A local firm enquires for purchasers of Sal B. G. Sleepers.

DIVI DIVI.

(N-214) A firm in London desires to be put in touch with exporters of Madras and Bellary divi divi.

GARJAN OR GURJAN OIL.

(N-219) A local firm enquires for purchasers of Garjan Oil.

NOTICE.

STATEMENT showing the quantity and value of the different descriptions of timber, other than Railway sleepers, imported by sea from abroad into the different maritime provinces of British India during the month of September 1924.

Province.	Deal and fine wood.		Teak wood.		Other timber.	
	Cubic tons.	Rs.	Cubic tons.	Rs.	Cubic tons.	Rs.
Into Bengal	196	17,126	...	...	344	36,617
,, Bombay	102	11,975	1,393	1,69,428	1,392	1,36,311
,, Sind	79	10,317	...	...	...	...
,, Madras	...	...	...	...	136	11,502
,, Burma	...	...	...	...	160	13,510
Total ...	377	39,418	1,393	1,69,428	2,032	1,97,940

The following notification has been received from the Conservator of Forests, Utilisation Circle, Burma.

GENERAL QUALITY SPECIFICATION FOR TIMBER FOR EXPORT FROM BURMA.

I.—EUROPE QUALITY.

Logs.

Logs must be straight and free from large flutes. Ends must be cut clear with saw or axe. Logs must be free from cup or ring shake, serious star shake or felling cracks. Burnt and split ends not admissible if the total extent of the damage extends more than twelve inches. Logs must be free from all externally visible pockets of rot and from resin pockets and dead branch holes of more than two inches diameter or one inch depth

Item No	Trade name.	Scientific name.	Description.	Market.	Apply to	Date.	Per	Prices.
	2	3	4	5	6	7	8	9
								Rs. Rs.
13	*Asna*	*Terminalia tomentosa.*	Logs ...	Mangalore North.	District Forest Officer, North Mangalore.	Jany. 1925	c. ft....	0-11-0
14	,,	,, ...	,, ...	Kasargod & Mangalore	See 222 ...	Novr. 1924	,, ..	1-4-0 to 1-8-0
15	,, ..	,, ...	Sawn scantlings ...	Kasargod ...	Do. ...	,,	,, ...	2-4-0
16	*Badam* ...	*Terminalia procera*	Squares ...	Calcutta ...	Martin & Co., Calcutta.	Decr. 1924	ton ...	75
17	,, ..	,, ...	Scantlings ..	...	Do. ..	,,	,, ...	80 to 120
18	*Bahan* ...	*Populus euphratica*	Billets 3′ long and above 3′ in girth.	Ghazi g h at, N.-W. Ry.	Divisional Forest Officer, Multan, Punjab	,, ...	c.ft. ...	0-8
19	,, ...	,, ...	Logs ...	C h a n g a Manga.	Divisional Forest Officer, Northern Plantation Division, Lahore.	Septr. 1924	,, ...	0-10
20	*Bakain* ...	*Melia Azedarach*	,, ...	,, ...	Do. ..	Novr. 1924	,, ...	1-4-3
21	*Baing* ..	*Tetrameles nudiflora*	,, ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ...	0-9 to 0-12
22	,, ...	,, .	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	1-8 to 2-0
23	*Banapu* ...	See *Asna.*						
24	Benteak ...	*Lagerstræmia microcarpa.*	Sawn Scantlings ...	Kallai, S. I.	See 1 ...	,, ...	c.ft. ...	3-8 to 4-0
25	,, ...	,, ...	Logs ...	...	Do.	,, ...	...	1-4 to 1-8
26	*Bija* ..	*Pterocarpus Marsupium.*	Round logs ...	Ballarsh a h D e p ô t, G. I. P. Ry.	Divisional Forest Officer, South Chanda, C. P	July 1924	c.ft. ...	1-2 to 1-5

27	,, ...	,, ..	Rough squared logs.	,, ...	Do. ...	,, ...	,, ...	1-4 to 1-7		
28	,, ...	,, ...	Logs ...	,, ...	Do. ...	Septr. 1923	,, ...	0-12		
29	,, ...	,, ...	,, ...	Wynad Forest Division	See 9 ...	Novr. 1924	,, ...	0-12-0 to 1-11-6 Auction.		
30	,, ...	,, ...	,, ...	Mangalore & Kasargod	See 222 ...	,, ...	,, ...	1-8-0		
31	*Bilithupu*	*Eugenia Garàneri*	,, ...	Kasargod	Do ...	,, ...	c.ft. ...	1-0-0		
32	Black Dammar.	*Dipterocarpus indicus.*	,, ...	Kallai, S. I	See 1	Jany. 1925	,, ..	1-4 to 1-8		
33	,, ...	,, ...	Sawn log ..	,, ...	Do ...	,,	,, ..	3-c tc 7 0		
34	,, ...	,, ...	Scantlings ...		Do ...	,, ...	,, ...	3-0 to 10-0		
35	,, ...	,, ...	Round logs .	Ballarshah Depôt, G. I. P. Ry.	See 26 ...	July 1924	,, ..	2-12 to 3-6		
36	,, ..	,, ...	Rough squared logs	,, ...	Do. ...	,, ...	,, ...	3-0 to 3-8		
37	,, ..	,, ...	Scantlings ..	,, ..	Do. ...	,, ...	,, ..	3-4 to 3 8		
38	Blackwood	*Dalbergia latifolia*	,, ...	Mangalore North.	See 13 ..	Novr. 1924	,, ...	0-12-0		
39	,, ...	,, ...	,, ..	Kasargod ..	See 222 ..	,, ...	,, ..	1-8 0 to 2-8-0		
40	,, ..	,, ...	Sawn scantlings ..	..	Do. ...	,, ...	,, ...	3-4-0		
41	*Bakli* ...	*Anogeissus latifolia*	Unsawn logs ..	Pollachi, S. I. Ry	See 158 ...	,, ...	,, ...	1-3-0		
42	Blue Pine	See *Kail.*								
43	Cedar Red	*Cedrela Toona* ...	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	c.ft. ...	1-8 to 1-12		
44	*Chil* or *Chir*	*Pinus longifolia* ...	Sleepers 12′ ...	Lalta Rao Depôt.	Depôt Forest Officer, Lalta Rao Depôt, Hardwar, U. P.	,, ...	score ...	No quotations.		
45	,, ..	,, ..	,, 12′ ...	Jagadhari ..	Timber Exploitation Officer, Chakrata	,, ...	piece ...	3-10	Whole sale rates.	
46	,, ...	,, ...	,, 10′ ...	,, ...	Do. ...	,, ..	,, ..	3-0		
47	,, ..	,, ...	,, 9′ ...	,, ...	Do. ..	,, ...	,, ..	2-14		
48	,, ...	,, ..	,, 12′ ...	,, ...	Do	,, ...	,, ..	4-0	Retail rates	
49	,, ...	,, ...	,, 8′	,, ...	Do. ...	,, ...	,, ...	3-4		
50	,, ...	,, ...	,, 6′ ...	,, ...	Do. ...	,, ...	,, ...	1-4-6		

Item No.	Trade name.	Scientific name.	Description.	Market.	Apply to	Date.	Per	Prices.	
1	2	3	4	5	6	7	8	9	
								Rs.	Rs.
51	*Chil* or *Chir*	*Pinus longifolia* ...	Beams ...	Jhelum ...	Divisional Forest Officer, Depôt West Division, Wazirabad.	October 1924	c.ft. ...	1-3-0 to 1-7-0	
52	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	0-10-4 to 1	
53	,, ...	,, ...	Logs ...	Doraha Dhilwan.	Divisional Forest Officer, Depôt East Division, Phillaur.	,, ...	,, ...	0-3-3	
54	,, ...	,, ...	Beams 12′ × 12″ × 6	,, ...	Do.	,, ...	,, ...	0-13-4	
55	,, ...	,, ...	Gattus ...	,, ...	Do.	,, ...	,, ...	0-7	
56	,, ...	,, ...	Scantlings ...	,, ...	Do.	Decr. 1924	,, ...	0-5-0 to 0-14-3	
57	,, ...	,, ...	Ballies ...	Changa Manga.	See 19 ...	Novr. 1924	,, ...	0-5-9	
58	,, ...	,, ...	Scantlings ...	Jhelum ...	See 84	,, ...	,, ...	0-4-3 to 0-12-1	Auction.
59	,, ...	,, ...	Karies 15′ ...	,, ...	Do ...	,, ...	,, ...	0-11-6	
60	,, ...	,, ...	,, 12′ ...	,, ...	Do. ...	,, ...	,, ...	0-5-4	
61	,, ...	,, ...	Sleepers 10′ ...	,, ...	Do.	,, ...	,, ...	0-5-9	
62	,, ...	,, ...	,, 8′ ...	,, ...	Do. ...	,, ...	,, ...	0-9-6	
63	,, ...	,, ...	,, 6′ ...	,,	Do ...	,, ...	,, ...	0-8-0	
64	,, ...	,, ...	Gattus 8′ ...	,, ...	Do. ...	,, ...	,, ...	0-8 5	
65	*Chorpayan*	*Hardwickia pinnata*	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ...	1-0 to 1-8	
66	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	3-0 to 3-8	
67	Deodar ...	*Cedrus Deodara* ...	Sleepers 12′ ...	Jagadhri ...	See 45 ...	Decr. 1924	piece ...	7-8 to 10	
68	,, ...	,, ...	,, 11′ ...	,, ...	Do. ...	,, ...	,, ...	7-4-	
69	,, ...	,, ...	,, 10′ B. G.	,, ...	Do. ...	January 1925	,, ...	7	Retail.
70	,, ...	,, ...	,, 9′ B. G.	,, ...	Do. ...	,, ...	,, ...	7	Retail.

71	,,	,,	,,	6′ M. G.	,,	Do.	,,	,,	2-15		
72	,,	,,	,,	8′	,,	Do.	,,	,,	6-0-3	Whole-sale rates.	
73	,,	,,	,,	6′	,,	Do.	,,	,,	2-12-0		
74	,,	,,	Beams		Jhelum	See 51	,,	c.ft.	2-4-0 to 2-13-6		
75	,,	,,	Gattus 8′×12″×6″		,,	Do.	,,	,,	0-10-3 to 2-9-0		
76	,,	,,	Logs		,,	Do.	July 1924	,,	1-0 to 1-9-6		
77	,,	,,	Sleepers		,,	Do.	,,	,,	0-10 to 2-10		
78	,,	,,	Scantlings		,,	Do.	,,	,,	1-6 to 2-2-10		
79	,,	,,	Logs		Doraha and Dhilwan.	See 53	Decr. 1924	,,	1-0 to 2-0		
80	,,	,,	Scantlings		,,	Do.	,,	,,	0-8-0 to 2-0-0		
81	,,	,,	Sleepers		,,	Do.	,,	,,	1-5 to 2-0		
82	,,	,,	Karies		,,	Do.	,,	,,	0-15 to 1-0.		
83	,,	,,	Slabs		,,	Do.	,,	,,	0-15-6.		
84	,,	,,	Logs		Jhelum	Divisional Forest-Officer, Lower Jhelum Division.	Novr. 1924	,,	0-8-7 to 1-4-8	Auction.	
85	,,	,,	Scantlings		,,	Do.	,,	,,	1-0 to 2-0-2		
86	,,	,,	Sleepers 10′		,,	Do.	,,	,,	0-4-10 to 1-6-5		
87	,,	,,	,,	9′	,,	Do.	,,	,,	1-11		
88	,,	,,	,,	8′	,,	Do.	,,	,,	1-4-10 to 2-4-6		
89	,,	,,	,,	6′	,,	Do.	,,	,,	1-1 to 1-9		
90	,,	,,	Karies 15′		,,	Do.	,,	,,	2 0		
91	,,	,,	,,	12′	,,	Do.	,,	,,	1-10-8		
92	,,	,,	Gattus 10′		,,	Do.	,,	,,	0-10-10 to 1-7-2		
93	,,	,,	,,	8′—	,,	Do.	,,	,,	1-12-4		
94	,,	,,	,,	6′	,,	Do.	,,	,,	1-9		
95	*Dhup*	*Canarium euphyllum*	Scantlings		Calcutta	See 16	Decr. 1924	ton	85-0 to 120-0		
96	*Dhupa*	*Vateria indica*	Logs		Kallai, S. I.	See 1	Jany. 1925	c.ft.	1-0 to 1-4		
97	,,	,,	,,		Kasargod	See 222	Novr. 1924	,,	0-14-0		
98	*Didu*	*Bombax insigne*	Scantlings		Calcutta	See 16	Decr. 1924	ton	75 0 to 105 0		
99	Ebony	*Diospyros Ebenum*	Logs		Kallai, S. I	See 1	Jany. 1925	c.ft.	6-0 to 8-0		

Item No.	Trade name.	Scientific name.	Description.	Market.	Apply to	Date.	Per	Prices.	
1	2	3	4	5	6	7	8	9	
								Rs.	Rs.
100	Ebony ...	*Diospyros Ebenum*	Scantlings ...	Jhelum ..	See 51 ...	August 1924	c.ft. ...	0-13-3 to 1-4	
101	,, ...	,, ...	Sleepers ...	,, ...	Do. ...	,, ...	,, ...	0-5 to 0-15-6	
102	*Fir* ...	*Abies Findrow* ...	Beams ...	,, ...	Do. ...	Octr. 1924	,, ...	0-12-6 to 0-14-6	
103	,, ...	,, ...	Scantlings ...	,, ..	Do. ...	,, ...	,, ...	0-5-0 to 0-11-0	
104	,, ...	,, ...	Logs ...	Doraha and Dhilwan.	See 53	,, ...	,, ...	0-3-3	
105	,, ...	,, ...	Scantlings ...	,, ..	Do. ...	Decr. 1924	,, ...	0-5-0 to 0-12-0	
106	,, ...	,, ...	Sleepers I class ...	,, ...	Do. ...	,, ...	,, ...	0-14	
107	,, ...	,, ...	Logs ...	Jhelum ...	See 84 ...	Novr. 1924	, ..	0-1-5 to 0-5	Auction.
108	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ..	,, ...	0-3-1 to 0-10-0	
109	,, ...	,, ...	Karies 15′ ...	,, ...	Do. ...	,, ..	,, ...	0-13-8	
110	,, ...	,, ...	,, 12′ ...	,, ...	Do. ...	,, ...	,, ...	0-9-9	
111	,, ...	,, ...	Sleepers 10′ ..	,, ...	Do. ...	,, ...	,, ...	0-3-1 to 0-7-11	
112	,, ...	,, ...	,, 8′ ...	,, ...	Do. ...	,, .	,, ...	0-6-9 to 0 72	
113	,, ...	,, ...	Gattus 8′ ..	,, ...	Do. ...	,, ...	,, ...	0-4-0	
114	,, ...	,, ...	,, 6′ ...	,, ...	Do. ...	,, ...	,, ...	0-2-0	
115	*Gumhar*	*Gmelina arborea* ...	Logs Round ...	Ballarshah	See 26	June 1924	,, ...	1-3 to 1-10	

116	,, ...	,, ...	Logs Rough squared	,, ...	Do. ...	,, ..	,, ...	1-9 to 1-12
117	*Gurjan* ... Andaman).	*Dipterocarpus turbinatus.*	Squares ...	Calcutta ..	See 16 ..	Decr. 1924	ton ...	85-0
118	,, ...	,, ...	Scantlings	,, ...	Do. ...	,, ...	,, ...	100 to 150
119	*Gurjan* ... (Burma).	,, ...	Logs ...	Calcutta ...	See 16 ..	May 1924	,, ...	147-8
120	,, ...	,, ...	Round logs ..	Ballarshah Depôt, G. I. P. Ry.	See 26 ...	July 1924	c.ft. ...	1-2 to 1-8
121	,, ...	,, ...	Rough squared logs	,, ...	Do. ...	,, ..	,, ...	1-4 to 1-9
122	,, ...	,, ...	Scantlings ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ..	2-0
123	*Halau* ..	*Adina cordifolia* ...	Logs ...	North Mangalore.	See 13 ...	Jany. 1925	,, ...	0-8-3
124	*Honne* ...	*Pterocarpus Marsupium.*	See *bija.*					
125	*Irool* ...	*Xylia xylocarpa* ...	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ..	1-4 to 1-8
126	,, ...	,, ...	Logs unsawn ..	Pollachi	See 158 ..	July 1924	,, ..	1-6-0
127	,, ...	,, ...	Poles ...	,,	Do. ...	Octr. 1924	,, ...	0-15
128	,, ...	,, ...	Logs ...	Mangalore North	D. F. O., North Mangalore.	Jany. 1925	,, ...	0-10-9 Auction.
129	,, ...	,, ...	,, ...	Mangalore & Kasargod.	See 222	,, .	,, ...	1-0-0 to 1-6-0
130	,, ...	,, ...	Sawn scantlings ...	Kasargod ..	Do ...	,, ...	,, ...	2-2-0
131	Jackwood ...	*Artocarpus integrifolia.*	Logs ...	Kallai, S. I	See 1 ...	,, ...	,, ...	1-8 to 2-0
132	,, ...	,, ...	Scantlings ...	,, ..	Do. ...	,, ...	,, ...	3-8 to 4-8
133	*Kail* ...	*Pinus excelsa* ...	Sleepers 12′ ..	Jagadhari ..	See 45 ...	,, ...	piece ...	4-10 Whole-sale rates.
134	,, ...	,, ...	,, 10′ ...	,, ...	Do. ...	,, ...	,, ..	No quotation.
135	,, ...	,, ...	,, 8′ ...	,, ...	Do. ..	,, ...	,, .	4-12 Whole-sale rates.
136	,, ...	,, ...	,, 6′ ...	,, ..	Do. ...	,, ...	,, ...	1-12-6 Whole-sale rates.

Item No.	Trade name.	Scientific name.	Description.	Market.	Apply to	Date.	Per	Prices.
1	2	3	4	5	6	7	8	9
								Rs. Rs.
137	*Kail* ..	*Pinus excelsa* ...	Scantlings ...	Jagadhri ...	See 51 ..	October 1924	c ft. ..	0-10-6 to 1-8-0
138	,, ...	,, ...	Beams ...	Jhelum ..	Do. ..	,, ...	,, ...	1-8-0 to 2-4-9
139	,, ..	,, ...	Logs ...	Doraha and Dhilwan.	See 53 ..	Novr. 1924	,, ..	0-11-0
140	,,	,, ...	Scantlings ...	,, ..	Do. ...	,,	,, ...	0-5 to 1-5
141	,, ..	,, ...	Sleepers I class ..	,, ...	Do. ...	Decr. 1924	,, ...	1-4
142	,, ...	,, ...	Other sleepers ...	,, ..	Do. ...	,, ...	,,	0 9-3 to 1-6
143	,,	,, ...	Karies ..	,, ..	Do. ..	,, ...	,, ...	0-12-0 to 0-13-0
144	,, ...	,, ..	Logs ...	Jhelum ...	See 84 ...	Novr. 1924	,, ..	0 4-5 to 1-0-10
145	,, ..	,, ...	Scantlings ...	,, ...	Do. ..	,, ..	,, ...	0-4-1 to 1-5-9
146	,,	,, ...	Karies 15′ ...	,, ...	Do. ...	,, ...	,, ...	1-9
147	,, ...	,, ...	,, 12′ ...	,, ...	Do. ...	,, ...	,, ...	0-6-8
148	,, ..	,, ...	Sleepers 10′ ...	,, ...	Do. ..	,, ...	,, ...	0-4-1 to 0-14-8
149	,, ...	,, ..	,, 8′ ...	,, ...	Do. ...	...	,, ...	0-9-1 to 1-3
150	,, ..	,, ...	,, 6′ ...	,, ...	Do. ...	,, ..	,, ...	0-11-6 to 0-13 6
151	,, ...	,, ...	Gattus 10′ ...	,, ...	Do ...	,, ..	,, ...	1-0
152	,, ...	,, ...	,, 8′ ...	,, ...	Do. ...	,, ...	,, ...	1-3-6.
153	,, ...	,, ...	,, 6′ ...	,, ..	Do. ...	,, ...	,, ...	1.0
154	*Konyin* ...	*Dipterocarpus turbinatus.*	See *Gurjan.*					

Auction.

155	*Karmaradu*	*Terminalia tomentosa.*	See *Asna.*						
156	*Kindal* ...	*Terminalia paniculata.*	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	c.ft. ...	1-4 to 1-8	
157	,, ...	,, ...	,, ..	Mangalore North.	See 13 ...	,, ...	,, ...	0-10-0 Auction	
158	,, ...	,, ...	Unsawn logs ..	Pollachi, South Indian Ry.	D. F. O., South Coimbatore.	Novr. 1924	,, ...	1-0 to 1-9	
159	,, ...	,, ...	Poles ...	,, ...	Do. ...	Octr. 1924	,, ...	1-1	
160	,, ...	,, ...	Sawn scantlings ...	,, ..	Do. ...	July 1924 ...	,, ...	2-4 to 2-8	
161	,, ...	,, ...	Logs ...	Mangalore & Kasargod.	See 222 ...	,, ..	,, ...	0-14-0 to 1-2-0	
162	,, ...	,, ...	Sawn scantlings ...	Kasargod ...	Do. ...	,, ..	,, ..	1-14-0	
163	,, ...	,, ...	Logs ...	Beypore ...	See 12 ...	Decr. 1924	,, ...	0-10-8	
164	Koko ...	*Albizzia Lebbek* ...	Scantlings ...	Calcutta ...	See 16 ...	,, ...	ton ...	90-0 to 150-0	
165	*Kiralbogi* ..	*Hopea parviflora* ...	Logs ...	Kasargod ...	See 222 ...	Novr. 1924	c.ft. ...	1-6-0 to 1-12	
166	,, ...	,, ..	Sawn scantlings ...	,, ...	Do. ...	,, ...	,, ...	2-8-0	
167	,, ...	,, ...	Logs ...	North Mangalore.	See 13 ...	Jany. 1925	,, ...	0-10-0.	
168	*Letpan* ...	*Bombax malabaricum.*	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ...	0-9 to 0-12	
169	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ..	,, ...	1-8 to 2-0	
170	*Matti* ...	*Terminalia tomentosa.*	See *Asan.*						
171	Mulberry ...	*Morus indica* ...	Logs ...	Changa Manga.	See 19 ...	Decr. 1924	c.ft. ...	0-14-3 to 3-7-5	
172	,, ...	,, ...	Selected Fuel ...	,, ...	Do. ...	,, ...	% c.ft.	17-1-11	
173	,, ...	,, ...	Ordinary Fuel ...	,, ...	Do. ...	,, ...	,, ...	10-9-6	
174	,, ..	,,	Billets ...	,, ...	Do. ...	Novr. 1924	c.ft. ...	0-7-9 to 0-10-6	
175	,, ...	,, ...	Logs ...	,, ...	Do. ...	,, ...	,, ..	1-0 to 2-8	
176	*Myrole* ...	*Vitex altissima* ...	,, ...	Kasargod ...	See 222 ...	,, ...	,, ...	1-0-0	
177	*Nangal* or *Nahor.*	*Mesua ferrea* ...	,, ...	Kallai, S. I.	See 1 ...	Jany. 1925	,, ...	2-0 to 2-4	

Item. No	Trade name.	Scientific name.	Description.	Market.	Apply to	Date.	Per	Price.
1	2	3	4	5	6	7	8	9
								Rs. Rs.
178	Padauk (Andamans).	*Pterocarpus dalbergioides.*	Squares ...	Calcutta ...	See 16 ..	Decr. 1924	ton ...	180-0
179	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ..	,, ...	150-0 to 200-0
180	Padauk (Burma).	*Pterocarpus macrocarpus.*	Squares ...	,, ..	Do. ...	,, ..	,, ..	175-0
181	*Pali* ..	*Dichopsis elliptica*	Logs ...	Kallai, S. I.	See 1 ..	Jany. 1925	,, ..	1-4 to 1-8
182	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	3-0 to 3-8
183	*Pani* ...	*Vateria indica* ...	See *Dhupa.*					
184	*Papita* ...	*Sterculia campanulata.*	Scantlings ...	Calcutta ...	See 16 ..	Decr. 1924	ton ..	70-0 to 107-8
185	*Payin* ..	*Vateria indica* ...	See *Dhupa.*					
186	*Pilamarudu*	*Terminalia paniculata.*	See *Kindal.*					
187	*Poon* ...	*Calophyllum tomentosum.*	Logs ...	Kallai, S. I.	See 1 ...	Jany. 1925	c.ft. ..	1-4 to 1-8
188	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	3-0 to 3-8
189	*Pula* ...	*Bombax malabaricum*	See *Letpan.*					
190	,, ...	,, ...	,, ...	Kasargod ...	See 222 ...	Novr. 1924	,, ...	1-0-0
191	,, ..	,, ...	Logs ..	Calcutta ...	See 16 ...	May 1924	ton ...	100-0
192	*Pullibaghi*	*Albizzia odoratissima.*	,, ...	Kasargod ...	See ...	Novr. 1924	c.ft. ...	1-0-0
193	*Pyinma* (Andaman)	*Lagerstræmia hypoleuca.*	Squares ...	,, ...	Do. ..	Decr. 1924	ton ...	120-0
194	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ..	100-0 to 150-0
195	*Pyinma* ...	*Lagerstromia Flos-Reginae.*	Logs ...	,, ...	See 222 ...	Novr. 1924	c.ft. ..	1-0-0
196	*Pyinkaao* ...	*Xylia dolabriformis*	Logs ...	,, ...	Do. ...	,, ...	ton ...	105-0

197	*Redpayan* ...	*Hardwickia pinnata*	See *Chorapayan.*					
198	Rosewood...	*Dalbergia latifolia*	See "Blackwood."					
199	*Sahajo* ...	*Terminalia tomentosa.*	See *Asna.*					
200	*Sain* ...	,, ...	,,					
201	*Saj* ...	,, ...	,,					
202	*Sal* ...	*Shorea robusta* ...	B. G. Sleepers ...	Dhamtari, C. P.	Divisional Forest Officer, South Raipur Division, Raipur, C. P.	October 1924	each ...	9-0
203	,, ...	,, ...	M. G. ,, ..	,, ...	Do. ...	,, ...	,, ...	3-4
204	,, ...	,, ...	N. G ,, ...	,, ...	Do. ...	,, ...	,, ...	2-0
205	,, ...	,, ..	Logs ...	Sapatagram	D. F. O., Goalpara Division, Assam.	Jany. 1925	c.ft. ...	1-2 to 1-8
206	*Sandan* ...	*Ougeinia dalbergioides.*	Round logs ...	Ballarshah Depôt, G.I.P. Ry.	See 26 ...	July 1924	,, ...	2-0
207	,, ..	,, ...	Rough squared logs	,, ...	Do. ...	,, ...	,, ...	2-2
208	*Semal* ...	*Bombax malabaricum.*	See *Leipan*					
209	*Shisham* ...	*Dalbergia Sissoo*...	Billets ...	Changa Manga.	See 19 ...	Novr 1924	c.ft. ...	1-0-6
210	,, ...	,, ...	Logs ...	,, ..	Do. ...	Decr. 1924	,, ...	1-3-6 to 1-10-4
211	,, ...	,, ...	Selected Fuel ..	,, ...	Do. ...	,, ...	% c.ft.	25-0-6
212	,, ...	,, ..	Ordinary ,, ..	,, ...	Do. ...	,, ..	,, ...	12-2-6
213	*Savan* ..	*Gmelina arborea* ...	Round Logs ..	Ballarshah, G. I. P. Ry.	See 26 ...	July 1924 ..	c.ft. ...	1-3 to 1-10
214	,, ...	,, ..	Rough squared logs	,, ...	Do. ...	,, ...	,, ...	1-9 to 1-12
215	*Taungpinne*	*Artocarpus chaplasa*	Scantlings ...	Calcutta ...	See 16 ...	Decr. 1924	ton ...	100-0 to 130-0
216	Teak ...	*Tectona grandis* ...	Selected India I class.	,, ...	The Manager, Calcutta Price Current and Money Market Report, Calcutta.	,, ...	ton of 50 c.ft.	180-0 to 185-0
217	,, ...	,, ...	Scantlings ...	Kallai, S. I...	See 1 ...	Jany. 1925	c ft. ..	1-2 to 1-8
			Logs ...	,, ...	Do. ...	,, ..	,, ...	2-8 to 8-0
218	,, ...	,, ...	Unsawn logs ..	Pollachi, South Indian Ry.	See 158 ...	Novr. 1924	,, ...	1-7 to 2-11
219	.. ...	..	Spokes and felloes	,, ...	Do. ...	,, ...	set †† ..	19-0

Item No	Trade name.	Scientific name	Description.	Market.	Apply to	Date.	Per.	Prices.
1	2	3	4	5	6	7	8	9
								Rs. Rs.
220	Teak ...	*Tectona grandis* ...	Sawn logs ...	Pollachi, South Indian Ry.	See 158 ...	October 1924	c.ft. ...	3-9
221	,, ...	,, ...	Poles ...	,, ...	Do. ...	,, ...	,, ...	1-1
222	,, ...	,, ...	Logs ...	Kasargod ...	District Forest Officer, South Mangalore.	Novr. 1924	,, ...	1-8-0 to 2-8-0
223	,, ...	,, ...	Sawn scantlings ...	,, ...	Do. ...	,, ...	,, ...	3-4-0
224	,, ...	,, ...	Logs Round 5′ and over in girth.	Ballarshah Depôt, G.I.P. Ry.	See 26 ...	July 1924	,, ...	2-12 to 3-8
225	,, ...	,, ...	Logs Rough Squared 5′ and over in girth.	,, ...	Do. ...	,, ...	,, ...	3-0 to 3-12
226	,, ...	,, ...	Logs Round 4′ to 4′ 11″ in girth.	,, ...	Do. ...	,, ...	,, ...	2-0 to 3-0
227	,, ...	,, ...	,, ...	,, ...	Do. ...	,, ...	,, ...	2-8 to 3-2
228	,, ...	,, ...	Logs Round 3′ to 3′ 11″ in girth.	,, ...	Do. ...	,, ...	,, ...	1-8 to 2-2
229	,, ...	,, ...	Logs Rough Squared 3′ to 3′ 11″ in girth.	,, ...	Do. ...	,, ...	,, ...	1-11 to 2-5
230	,, ...	,, ...	Rough squares ...	Calcutta ...	See 1 ...	Decr. 1924	ton ...	140
231	,, ...	,, ...	* * * * ...	Rangoon ...	Divisional Forest Officer, Depôt and Agency.	,, ...	,, ...	77-9-0
232	,, ...	,, ...	* * * ...	,, ...	Do. ...	,, ...	,, ...	63-0 †Auction.
233	,, ...	,, ...	* * ...	,, ...	Do. ...	,, ...	,, ...	50-0

234	,, ...	,, ...	* ...	,, ...	Do. ...	,, ...	,, ...	38-14-6			
235	,, ...	,, ...	D ...	,, ...	Do. ...	,, ...	,, ...	53-13-11			
236	,, ..	,, ..	E ...	,, ..	Do. ...	,, ...	,,	57-0			
237	,, ...	,, ...	Logs above 4 cds.	Beypore ...	See 12 ...	Decr.	1924	c.ft. ...	1-7-6.		
238	,, ...	,, ...	Logs above 2 cds.†††	,, ...	Do. ...	,,	...	,, ...	1-12-7		
239	,, ...	,, ...	Logs below 2 cds.†††	,, ...	Do. ...	,,	.	,, ...	1-9-0		
240	,, ...	,, ...	Rough Squared logs, Bori forest	Timarni .	Manager, The Rajabarari Estate, Timarni, G. I. P. Ry.	,,	...	,, ...	1-12 to 3-0		
241	,, ...	,, ...	Rough squared logs of Rajabarari Forest and Rahetgaon Forest.	,, ...	Do. ...	,,	...	,, ...	1-4 to 2-8		
242	,, ...	,, ...	Sawn wood ...	,, ...	Do . ..	,,	..	,, ...	3-0 and above.		
243	*Thadan* ..	*Grewia latifolia*	Unsawn logs ...	Pollachi, South Indian Ry.	See 158 ...	,,	..	,, ...	0-12 to 1-1		
244	*Thitpok* ...	*Tetrameles nudiflora.*	See *Baing.*								
245	*Tiwas* ...	*Ougeinia dalbergioides.*									
246	*Tun* ...	*Cedrela toona* ...	See "Cedar Red".								
247	*Vellamarudu.*	*Terminalia paniculata.*	See *Kindal.*								
248	*Vengai* ...	*Pterocarpus marsupium.*	See *Bija.*								
249	Venteak ...	*Lagerstræmia lanceolata.*	Unsawn logs ...	Pollachi, South Indian Ry.	See 158 ...	Novr.	1924	c.ft. ...	1-0-6 to 1-5-6		
250	,, ...	,, ...	Poles ...	,, ...	Do. ..	October	1924	,, ...	1-1		
251	,, ..	,, ...	Logs ...	Bejapore ..	See 12 ...	,,	..	,,	0-11-9		
252	,, ...	,, ...	,, ...	Mangalore North.	See 13 ...	Jany.	1925	,, ..	0-9-0 Auction.		
253	,, ...	,, ...	Logs ...	Mangalore & Kasargod.	See 222 ...	Novr	1924	,, ...	1-0-0 to 1-4-0		
254	,, ...	,, ...	Sawn scantlings ...	Kasargod...	Do. ..	,,	...	,, ...	2-0-0		

Item No.	Trade name.	Scientific.	Description.	Market.	Apply to.	Date.	Per.	Prices.
1	2	3	4	5	6	7	8	9
								Rs. Rs
255	White Chuglam.	*Terminalia bialata*	Squares ...	Calcutta ...	See 16 ...	Decr. 1924	ton ...	85-0
256	,, ...	,, ...	Scantlings ...	,, ...	Do. ...	,, ...	,, ...	90-0 to 140-0
257	White Dammar.	*Valeria indica* ...	See *Dhupa.*					

†† Set = 24 Spokes and 12 felloes.

††† Candi is equal to 800 lbs.

NOTE † Following are the specifications for the Burma Teak quotations which appear above from item No. 231 to No. 236 :—

B-1 or **** : All logs 8 feet and up which contain not more than two standard defects and have a minimum diameter of 15 inches at top end.

B-2 or *** : All logs 8 feet and up containing three standard defects and having a minimum diameter at top end of 12 inches.

C-1 or ** : Logs of all qualities worse than those which would qualify for *** with a minimum diameter at top end of 12 inches.

C-2 or * : Logs of all qualities less than 12 inches top diameter except such as are classed in D.

D : Houseposts.—Small straight logs to meet the demand for houseposts should be placed in this class whether they actually come under any of the above classes or not.

E : Crooks.—Crooked logs suitable for shipbuilding to be placed in this class whether they fall in one of the other classes or not.

1. This list of quotations is issued as a general guide, and neither the Forest Economist nor the officers or firms quoting are in any way bound to prices given in column 9.

2. Further quotations are invited. They are inserted free of charge and should reach the Office of the Forest Economist, Forest Research Institute, Dehra Dun, U. P., by the 8th instant monthly. Even though rates remain the same it is a great help if Divisional Forest Officers send in quotations monthly so that readers then know that the rates are up-to-date.

3. Enquiries regarding the technical properties and identification of timbers may be addressed to the Forest Economist, Forest Research Institute, Dehra Dun, United Provinces.

4. Notices of Auctions should reach the Forest Economist by the 8th of the month previous to that in which the auction is to be held.

DEHRA DUN:
The 15th January 1925

H. TROTTER,
Assistant Forest Economist.

QUOTATIONS FOR MINOR FOREST PRODUCTS.

Names of Products	Market for which quoted.	Latest prices received.	Per	REMARKS.
Bees-wax	Calcutta ...	Rs. 59 to Rs. 65	md.	
,, E. I. Yellow	London ...	†£5 10*s.* to £6	cwt.	
,, ,, ...	Kollegal ...	Rs. 48	,,	
Camphor—Japan	London ...	†2*s.* 10*d.*	lb.	
,, ,, ...	Calcutta ...	Rs. 280 to Rs. 300	Fy. md.	Fy. md. = 74 lbs.
Cardamoms—bleached bags	New York	†Rs. 4-13-10 to Rs. 6-2-5	lb.	
,, Mysore	London ...	†6*s.* to 8*s.*	,,	
,, Indian ...	,, ...	†6*s.* to 7*s.* 6*d.*	,,	
Cutch	,, ...	45*s.* to 50*s.*	cwt.	
,, Red Tablets...	Rangoon ...	Rs. 87-8 to Rs. 90	% Viss	Viss 3·6 lbs.
,, Black ,, ...	,, ...	Rs. 72-8 to Rs. 69		
,, Block ,, ...	,, ...	Rs. 80 to Rs. 89-8		
,, Soft ,, ...	,, ...	Rs. 70 to Rs. 77-8		
Elephant Tusks—				
(50 lbs. and up, soft)	London ..	†£100 to £134	cwt.	
(under 50 lbs.)	,, ...	†£78 to £123	,,	
,, ,, ...	Jowai Sub-Divn., Assam.	Rs. 11-9-0	seer	
,, ,, ...	Kamrup Dn., Assam.	Rs. 19 to Rs. 20	,,	
Fibres and Flosses—				
Aloe Fibre	London ...	No quotations.		
Coir	Calcutta ...	Rs. 5-4 to Rs. 7-8	B. md.	In bales of 200 lbs.—
Kapok (Floss)	,, ...	Rs. 46 to Rs. 46-8	,,	Do. 165 ,,
,, (Fibre)	London ...	†1*s.* 2¾*d.* to 1*s.* 3¼*d.*	lb.	
Kitool ,, ...	,, ...	†8*d.* to 1*s.* 2*d.*	,,	
Rhea or China grass ... -	,, ...	†£62 10*s.* to £69	ton.	
Gambier	,, ...	87*s.* 6*d.*		

Names of Products.	Market for which quoted.	Latest prices received.	Per	REMARKS.
Gums—Arabic, first	New York	†Re. 0-11-11 to Re. 0-12-4	lb.	
Kino	,, ...	†Re. 1-6-11 to Re. 1-9-2	,,	
Olibanum siftings	,, ...	†Re. 0-4-7 to Re. 0-5-6	,,	
,, ...	London ...	†90*s.* to 95*s.*	cwt.	
Hemp—Sisal	,, ...	†£33 to £53	ton.	
Hides—Cow (arsenic)	Calcutta ...	Rs. 9-8 to Rs. 20	20 lbs.	
East India	London ...	†5*d.* to 1*s.* 3*d.*	lb.	
Buffalo	Calcutta ...	Rs. 4 to Rs. 9		
Honey	Kollegal ...	Rs. 21 to Rs. 22	cwt.	
Lac Seed	London ...	†500*s.*	,,	
Lac (Stick, Kusmi)	,, ...	†210*s.*	,,	
Mowra Seed	Bombay ...	Rs. 10-2	,,	
Myrobalans—				
Central Provinces	London ..	†11*s.*	,,	
Bombay	,, ...	†10*s.* 3*d.*	,,	
Indian	Calcutta ...	Rs. 2-12 to Rs. 3-12	B. md.	
,, ...	,, ...	Rs. 3-15 to Rs. 5	,,	Crushed nuts.
Nux Vomica—Indian	,, ...	Rs. 4-8 to Rs. 5	,,	
Buttons	New York	+Re. 0-2-2 to Re. 0-2-3	lb.	
Oils—				
Citronella	London ...	†3*s.* 1*d.* to 6*s.* 2*d.*	,,	
Eucalyptus	,, ...	†2*s.* to 2*s.* 2*a.*	,,	
Lemon	,, ...	†3*s.* 3*d.*	,,	
Lemon Grass	,, ...	†4*s.* 8*d.*	,,	

Sandalwood	New York	†Rs. 19-4-11 to Rs. 20-0-4	,,	
Rosha Grass	Bombay ...	Rs 16	seer	
Vetivert Indian	New York	†Rs. 42-14-5 to Rs. 51-7-8	lb.	
,, Mysore	London ...	No quotations.		
Red Sanders	London ...	†£12	ton	
Rosin "F" Grade, American ...	Bombay ...	Rs. 8-9-8	md.	
,, "G" ,, ,, ...	Calcutta ...	Rs. 60 to Rs. 65	barrel	Barrel = 4 cwt.
,, "G" ,, ,, ...	London ...	†17*s.* 6*d.*	cwt.	
,, "G" ,, ,, ...	Calcutta ...	Rs. 13-8	,,	
,, I ,, ,, ...	New York	†Rs. 22-2-8	barrel	Barrel = 280 lbs.
,, I ,, ,, ...	London ...	†No quotations.		
,, K ,, ,, ...	New York	†Rs. 22-7-3	barrel	Barrel = 280 lbs.
,, M ,, ,, ...	,, ...	†Rs. 22-11-9	,,	Do.
,, N ,, ,, ...	,, ...	†Rs. 23-4-11	,,	Do.
,, WG ,, ,, ...	,, ...	†Rs. 23-9-7	,,	Do.
,, WG ,, ,, ...	London ...	†18*s.* 6*d.*	cwt.	
,, WW ,, ,, ...	,, ...	†20*s.*	,,	
,, WW ,, ,, ...	New York	†Rs. 27-2-9	barrel	Barrel = 280 lbs
,, Indian Government, Jallo Factory ...	Karachi ...	Rs. 11	md.	
,, ,, ,, ...	Bombay ...	Rs. 12-12	cwt.	
,, ,, ,, ...	Madras ...	Rs 9	md.	
,, Indian Turpentine & Rosin Company (Clutterbuckganj Factory).	Calcutta ...	No quotation.		
Rubber, Indian	Calcutta ...	Rs. 15 to Rs. 50	,,	
,, Para	London ...	†1*s.* 5½*d.* to 1*s.* 5¾*d.*	lb.	
Shellac, T. N.	Calcutta ...	Rs. 133	B. md.	
,, ,, ...	London ...	†325*s.* to 330*s.*	cwt.	
,, Orange	,, ...	†349*s.* to 420*s.*	,,	
,, A. C. Garnet	,, ...	†272*s.* to 275*s.*	,,	
,, ,, ,, ...	Calcutta ...	Rs. 120	B. md.	
,, Button pure	,, ...	Rs. 150	,,	
Spices—Cinnamon	London ...	†1*s.* 9*d.* to 1*s.* 10*d.*	lb.	
,, Pepper, India	Calcutta ...	Rs. 19 to Rs. 21	Fy. md.	
,, ,, Tellicherry	London ...	†5⅜*d.* to 6*d.*	lb.	
Tamarinds—Indian	Calcutta ...	Rs. 7 to Rs. 7-8	B. md.	
Thymol—Indian	London ...	†16*s.* to 6*s.*	lb.	

Names of Products	Market for which quoted.	Latest prices received.	Per	Remarks.
Turpentine—				
American Spirit Spot	London ..	†60*s.* 9*d.*	cwt.	
Blundel & Co.	Bombay ...	Rs. 7-8-4	gallon	
Standard Oil Co.	,, ...	No quotations.		
Hubbuck's Genuine	Calcutta ...	Rs. 6	per gallon.	
Turpentine, Indian Government, 5 gall. drum (Jallo Factory).	Karachi ...	Rs. 31	,,	
,, ,, ,, ...	Bombay ...	Rs. 5-12-10	,,	
,, ,, ,, ...	Madras ...	Rs. 5 to Rs 6	,,	
,, Indian Turpentine & Rosin Company, 5 gall. drum (Clutterbuckganj Factory).	Calcutta ...	No quotations.	,,	
Wood Pulp—				
Chemical	London ...	†£13 5*s.* to £19 10*s.*	ton	
Mechancial (moist)	,, ...	†£4 2*s.* 5*d.*	,,	
,, (dry)	,, ...	†£8 10*s.* to £8 10*s.* 6*d.*	,,	

Note.—† Represents rates for December 1924.

Md. indicates Bengal Maund which is equal to 82 lbs.

Prices not marked in the third column are the latest market rates

Dehra Dun, U. P.:
The 15th January 1925.

H. Trotter,
Assistant Forest Economist.

PUBLICATIONS RELATING TO INDIAN TIMBERS.

1. Manual of Indian Timbers, by J. S. Gamble, M.A., C.I.E., F.L.S., F.R.S.

2. Sylviculture of India Trees, by R. S. Troup, M.A., C.I.E., I.F.S.

3. Indian Forest Utilisation, by R. S. Troup, M.A., C.I.E., I.F.S.

4. Commercial Guide to the Economic Products of India, by R. S. Pearson, F.L.S., I.F.S.

*5. Hand Book of Forest Products of Burma, by A. Rodger, I.F.S.

6. Indian Woods and Their Uses, by R. S. Troup, M.A., C.I.E., I.F.S.

7. A Note on Antiseptic Treatment of Indian Timbers, by R. S. Pearson, F.L.S., I.F.S

*8. A Note on Andaman Timbers, by Martin & Co.

9. Notes for the Use of Consumers of Forest Products in the Punjab.

*10. A Further Note on the Antiseptic Treatment of Timbers, by R. S. Pearson, F.L.S., I.F.S.

11. Results of the Antiseptic Treatment of Sleepers, by R. S. Pearson, C.I.E., F.L.S., I.F.S.

*12. Bamboos for Paper Pulp, by R. S. Pearson, F.L.S., I.F.S.

*13. Bamboos for Paper Pulp, by W. Raitt, F.C.S.

*14. Paper Pulp Supplies from India, by W. Raitt, F.C.S.

*15. Seasoning of Timbers, by R. S. Pearson, F.L.S., I.F.S.

16. Relative Strength of Nature and Plantation Grown Teak.

17. Further Experiments in the Air-Seasoning of Timbers & General Recommendations as to Seasoning Methods, by C. V. Sweet, B.S., M.F.

18. Note on Gumhar (*Gmelina arborea*).

19. Note on Bija Sal (*Pterocarpus marsupium*).

20. Note on Sain (*Terminalia tomentosa*).

21. Note on Benteak (*Lagerstræmia lanceolata*).

22. Note on Sandan (*Ougenia dalbergioides*).

23. Note on Dhaura (*Anogeissus latifolia*).

24. Note on Blackwood (*Dalbergia latifolia*).

25. Note on Dhauri (*Lagerstræmia parviflora*).

26. Note on Sundri (*Heritiera minor*).

27. Note on Red Sanders (*Pterocarpus santalinus*).

28. Note on Babul (*Acacia arabica*).

29. Note on Kokan (*Duabanga sonneratioides*).

30. Note on Hollong (*Dipterocarpus pilosus*).

31. Note on Pyinma (*Lagerstræmia Flos-Reginae*).

32. Note on Indian Sumach (*Rhus Cotinus*).

33. Note on Haldu (*Adina cordifolia*).

34. Note on Odina Wodier.

35. Note on Semal (*Bombax malabaricum*).

*36. Note on Burmese Leza Wood (*Lagerstræmia tomentosa*)

*37. Note on Carallia Wood (*Carallia integerrima*).

*38. Note on Petwun (*Berry Ammonilla*).

39. Burmese In Wood (*Dipterocarpus tuberculatus*).

40. Burmese Padauk (*Pterocarpus macrocarpus*).

*41. Andaman Marble or Zebra Wood.

*42. Note on Gurjan (*Dipterocarpus turbinatus*).

43. Note on Thingan (*Hopea Odorata*).

44. Note on Kindal or Hongal (*Terminalia paniculata*).

45. Mechanical, Physical and Structural properties of wood grown in India.

46. Summary of results of Treated and Untreated Experimental Sleeper laid in the various Railway Systems of India brought up-to-date, by R. S. Pearson, C.I.E.

47. Interim Report on the work under Project No. 1 and No. 0 by the Section of Timber Testing including the results of the Mechanical and Physical Tests on certain of the commoner Indian Timbers up to end of 1922.

*48. Note on the Strength, Treatment and Durability of Sain (*Terminalia tomentosa*) sleepers.

*49 Note on the Tan Investigation of the Burma Hill Pine, *Pinus Khasya*, bark and *Pyinkado Xylia dolabriformis*.

*50. Analysis of the Tanning Properties of certain Burma *Lagerstræmias*.

*51. Tannin Investigation of some Burmese *Dipterocarps*.

The above publications are obtainable from

THE MANAGER, GOVERNMENT OF INDIA, CENTRAL PUBLICATION BRANCH, *CALCUTTA;* and Messrs. Thacker Spink & Co., Calcutta.

A limited number of those marked with an asterisk are available for issue to *bonâ fide* enquirers from

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N.B.—**Copies of Item Nos. 2, 4, 6, 17, 18, 29, 43, 45, 46 and 47 can also be had on payment from the Librarian, Forest Research Institute and College, Dehra Dun, U. P.**

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